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AND RECORD OF PROGRESS IN ARTS, INDUSTRY, AND MANUFACTURES,

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CONTENTS.

PAGE.
Applications for Letters Patent . . 1
Industrial Organizations 3

Reviews—

On the Construction of Artificial Limbs . . 4
Twelve Months' Experience with the A B C Process of Purifying Sewage 4
Advantages of Gas for Cooking and Heating. 5
Prize Essay on the Balance Spring. . . . 6
Gregory's British Metric System 6
The Mineral Surveyor and Valuer's Guide . 7
A Budget of Paradoxies 7
Lectures on the Philosophy of Law . . 7
The Astronomical Almanack for 1873 . . 7
Songs for Sailors 7
PAGE.
Harold Erle 7
Memoirs of Baron Stockmar 7
A Lady of the Last Century 7
The "Fortnightly Review" 8
The Metropolitan Weekly & Provincial Press. 8
Boscobel; or, the Royal Oak 8
Memoir of Nathaniel Hawthorne . . . 8
Honour to Inventors 9
Improvements in Spinning Mules . . 9
Asbestos Steam Packing 9
Redwell's Life-Saving Boat Fittings . 9
Dock for Circular Ironclads 9
Scientific Expedition in H.M.S. *Challenger* 10
The Bessemer Channel Steamer. . . 10
PAGE.
Horticulture of the Past Year. . . . 10
The Falling Stars. 10
Improved Billiard Tables 10
Monthly Notices 11
The Inventors' Institute 12

Proceedings of Societies—

Institution of Civil Engineers. . . . 13
The Victoria (Philosophical) Institute . . 13
Society of Biblical Archæology . . . 14
Zoological Society of London 14
Vienna Universal Exhibition, 1873 . . 14
Irrigation in India 15
Telegraph Amalgamation 15
Applications for Letters Patent . . 16

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APPLICATIONS FOR LETTERS PATENT.

⁎ *In this list (Com.) means Invention communicated from abroad.*

Further information, as to the progress of these Patents by Notice to Proceed, Sealing, and Specifying, can be obtained at the Office, 21, *Cockspur-street, Charing Cross.*

On December 4th.—3649 to 3673.—O. Gilson. Sofa or box ottoman, so constructed that it can be very easily converted into a six feet long by four feet six inches wide spring-mattress bedstead, but can be adapted to suit any size as occasion may require, of wood or iron, and fit for drawing, dining, or sitting room, without the slighest appearance of being a bed.—B. Johnston, E. B. Ellington, and J. H. Harrison. Apparatus for raising and transporting loads.—J. Herbert. Folding frame. applicable to baskets, gueridons, or other similar purposes.—W. E. Teale. Guards for gaslights, and in improved method of lighting gas while under the protection of guards. —H. A. Bonneville. Machines for spinning wool, cotton, silk, and fibrous materials in general (com.) (Complete specification.)—W. B. Woodbury. Photo-mechanical printing, and apparatus and appliances therefor.—R. Taylor. furnaces for heating iron bars and sheet-iron plates.—J. H. Kenyon and J. Kenyon. Machinery for carding cotton and other fibrous substances.—G. Smith. Fire-proof buildings. —J. Elsden. Combination of scarf, tie, or cravat, and false shirt front for gentleman's wear.—W. E. Gedge. Preventing trains from running off the rails, and also of braking or stopping railway trains (com.)—S. Clayton. Hydraulic and hydrostatic cranes.—W. Cornish. Means and apparatus employed for supporting and maintaining the saloons, cabins, platforms, or floors of steam ships or other vessels in a horizontal position, independently of the motions of the hulls of such vessels, to lessen or prevent sea sickness, and for other purposes.—G. A. Haworth. Slide valves for steam engines.—J. Viles. Cleaning and polishing plate and other similar purposes.—I. Brown. Hurdling sheep and cattle, and the hurdles employed therefor. —D. Robertson. Stuffing boxes for piston valve and pump rods, which may also be used for other similar purposes.—M. Evans. Signalling in railway trains.—W. R. W. Smith. Burning or consuming smoke and apparatus employed therefor.—W. E. Newton. Cast steel, and refining pig or cast iron (com.)—S. Fillingham and J. Pardoe. Securing, preparing for printing, bleaching, cleansing, and drying, ready for beaming and folding, woollen, worsted, linen, cotton, or mixed fabrics, either woven or felted.—Major-Gen. H. Y. D. Scott, C.B., and T. W. Scott. Mode of and apparatus for preparing lime for the treatment of sewage.—R. H. Middleton. Mule indicators.—A. S. Owen. Means for obtaining electric currents (com.)—W. L. Duncan. Sole to be worn by pedestrians to prevent slipping.

BRITISH MUSEUM

On December 5th.—3674 to 3687.—R. Maynard. Machines for elevating straw, hay, and corn.—G. Booth. Manufacture of sickles.—F. G. Mort on Treating tin-plate waste scraps or clippingstfor separating or removing the tin and other matters from the iron.—J. Picot. System of elastic spring mattresses.—W. R. Lake. Manufacture of malleable cast iron and cast steel, and in furnaces therefor (com.)—W. P. Garbutt. Machinery or apparatus for the manufacture of bricks, tiles, and other articles from the plastic bodies or material.—T. Petitjean. Production of metallic surfaces and articles of various forms by chemical means and the electro deposition of metals, which surfaces or articles are produced either highly polished, dead or matted, engraved, or otherwise ornamented. — W. Donaldson. Joints for stoneware and earthenware sewer or other pipes.—T. Ivory. Apparatus for heating and cooling liquids, which apparatus is applicable for generating and condensing steam and other vapours, and for distilling liquids.—J. Sheffield. Furnaces for melting glass, which furnaces may also be used for other purposes.—J. C. A. Henderson. Ladies'skirts or petticoats. —F. M. Lyte. Apparatus for distilling, concentrating, and evaporating (com.)—A. Browne. Apparatus for raising sunken or wrecked vessels. (com)—R. S. Best. Phosphates of soda and potash and chloride of ammonium; also the manufacture of chemical manures and alkalies.

On December 6th.—3688 to 3704.—J. Brocklehurst, and J. Crossley. Stench traps.—W. R. Lake. Coupling for railway carriages (com.)—S. Lewin. Ploughs.—W. R. Lake. Horse-shoe nails (com.)—M. Henry. Preserving and protecting ships' sheathing and other metal surfaces exposed to the action of sea water (com.)—G. Haseltine. Meters for gas or liquids (com.) (Complete specification.)—G. Spencer and U. Scott. Parts of railway and other carriages.—M. Benson. Lamps (com.) (Complete specification.) —T. Green. Treatment of bones and other articles, and apparatus for the same.—G. T. W. Gutteridge. Carriage heads.—A. V. Newton. Cutting pliers (com.)—J. Parkins. Match box.—A. G. Brookes. Obtaining motive-power (com.)—G. K. Winter, F.R.A.S. Electric telegraphs.—W. E. Newton. Assembling and uniting pieces of metal for the manufacture of ordnance tubes and other structures composed of united metals (com.)—F. Wilkinson. Sizing, dressing, or preparing yarns or threads and woven fabrics of cotton and other fibrous materials, applicable also to colouring the said yarns or threads.—W. T. Hamilton. Mechanism or apparatus for producing and transmitting reciprocating motions.

On December 7th.—3705 to 3726.—M. Benson. Machine for cleaning and purifying middling (com.)—T. Redmayne. Desks, seats, and music stands, applicable to the use of schools and other purposes.—I. A. Vacherot. Propelling vessels and the apparatus or means employed therein. —J. H. Weston. Construction of vent pegs.— C. Cross. Manufacture of velvets, velveteens, and other similar piled fabrics.—J. Tindal. Finishing cloth, and the machinery or apparatus employed therefor.—A. Toller and A. Smyth. Fire bars.—W. E. Gedge. Waterproof and anti-radiating textile-felt-fabric (com.) — C. Burrell and T. J. Pullen. Construction and carts for distributing sandstones, lime, or any other similar material.—J. H. Cohrs. Apparatus and brakes for facilitating the stoppage and removing of tramway carriages and other vehicles which have the wheels fastened on the axles. —R. J. Harrison. Appliances for raising and lowering carriage heads or assisting to raise and lower them.—G. Sinclair. Apparatus for pulping fibrous substances and for evaporating liquids, part or parts of which improvements are applicable to steam generators.—W. R. W. Smith. Burning or consuming smoke and apparatus employed therefor.—G. Tidcombe. Apparatus employed in the manufacture of paper.—G. L. Scott. Moulds for casting what are commonly called "steel ingots."—D. Servante. Machinery for letter-press printing, parts of which improvements are applicable to lithographic printing.—J. C. Wiltsher. Construction of thrashing machines.—W. R. Lake. Lubricating apparatus for shafting and other parts of machinery (com).—W. Wilkinson and G. E. Taylor. Machinery or apparatus for casting metals.—J. Tangye. Expansion gear for direct-acting steam pumping engines. —R. S. Taylor. Machinery or apparatus for ventilating coal or other mines.—J. F. Clarke. —Watercloset apparatus.

On December 9th.—3727 to 3739.—A. Henry Breech-loading fire-arms.—J. F. Shedlock and J. J. Shedlock. Lighting of towns and districts, and apparatus connected therewith.—T. Edmeston. Machinery used for manufacturing and finishing rivets, spikes, headed pins for screws and bolts, and similar fasteners, parts of the same being also applicable to machinery for stamping or punching articles requiring a hole or indent.—W. N. Nicholson. Horse rakes, part of which invention may be applied to other agricultural machines.—W. Morgan-Brown. Chimney cowl or aerial aspirator (com.)—S. Hill. Improved tubular refrigerating or cooling apparatus.—J. Stapleton. Platforms of turrets on board ships of war, placed within a hollow hemisphere fixed in the ship's hold, and applying the laws of gravitation there, so as at all times the platform will present a horizontal surface, notwithstanding the rolling and pitching of the ship.—W. Hart and J. Hart. Apparatus for drying sewage, precipitates, cement, paper pulp, and other fluid or semi-fluid matters.—A. Jaynor. Automatic telegraphs to be worked by air, steam, or gas.—W. R. Lake. Improved insulating compound for telegraphic purposes (com.)—W. R. Lake. Improved method of clarifying and settling varnishes, oils, and other like substances (com.) (Complete specification.)—W. T. Hamilton. Mechanism for working the valves of steam and other motive-power engines.—M. W. Hilles. Steam boiler.

On December 10th.—3740 to 3750.—J. Sloper. Tools or apparatus for producing perforations (grouped to represent marks, letters, figures, or devices upon or) through paper and other materials.—W. A. Lyttle. Candles.—M. Chambers and M. Chambers. Apparatus employed in the sizing or filling of woven fabrics. L. de Negroni. Stopping run-away horses.—W. Key. Gas-retort settings.—R. Barrington. Prevention of fraud on the part of collectors of fares on omnibuses, tramway cars, other conveyances, theatres, and all other places where it is necessary to check the collection of money. C. Hervey. Washing, wringing, and mangling machines.—S. Mendel. Packing bales of cotton and other fabrics.—W. H. Platt. Shuttles. —J. Foster, jun. Collecting and removing the refuse of carding engines.—A. V. Newton. Setting and adjusting carbon points or cutting tools (com).

On December 11th.—3751 to 3764.—W. Davis. Shipping and unshipping screw propellers, and apparatus connected therewith.—J. H. Louche. Turbines.—T. Newall. Indicator for self-acting and other mules.—W. T. Harvey. Lamps for burning mineral and other oils.—Major-General H. Y. D. Scott. Treatment and utilization of sewage water.—W. T. Hamilton. Machinery for cutting dove-tails.—J. Macintosh and W. Broggett. Methods of protecting the human head from solar heat.—C. F. Claus. Bricks, blocks, tiles, or other like articles capable of being employed for building or other purposes.—G. Haseltine. Wood pavements (com.) (Complete specification.)—J. King, J. M. King, and T. D. M. King. Dry closets and commodes.—A. Allan. Land and sea batteries, a part of which improvement is also applicable for obtaining steady saloons, platforms, or supports for various purposes on board ship.—S. Tuddenham. Ornamental metal-work, and in the machinery or apparatus employed therein. R. S. Casson. Puddling furnaces, heating furnaces, and other reverberatory furnaces used in the manufacture of iron and steel (com.)—G. Hamit. Machinery used in draining land.

On December 12th.—3765 to 3776.—M. A. Soul. Machinery or apparatus for boring rocks and such like hard substances (com.)—W. E. Gedge. Motive-power engine, actuated by soluble gases (com.)—L. Chiris. System of mechanical kneading trough applicable to the baking of bread.—M. H. Kernaul. Sewing machines.—J. V. Hatch. Magic-lantern slide holders.—J. Bullough. Machinery for sizing and drying yarn, and means or method of and apparatus for utilizing waste heat therefor (Complete specification.)—C. James. Apparatus for exhausting, forcing, and propelling air and other fluids.—T. F. Henley. Mode and means of warming beds and couches.—M. J. Roberts. Safety valves.—J. Bullough and J. Leachman. Preparing and spinning cotton and other fibres.—J. Hunt. Manufacture of gunpowder and the apparatus employed therein.—W. E. Newton. Governors in which balls or rotating weights are employed, the said improvements being applicable to such governors for whatever purpose they may be employed (com.)

On December 13th.—3777 to 3788.—B. G. George. Stop valve or stop valve capsule for bottles and other like vessels holding fluids (com.)—W. R. Lake. Railway carriage wheels (com.)—E. J. Harling. Keys and commutators for telegraph instruments.—P. Love. Machinery for excavating and treating substances excavated, especially applicable for the conversion of bog moss or fen into peat for fuel.—W. Glaze. Cupola or furnace for smelting iron.—C. Lockman. A hand power for driving sewing machines.—E. Newton and W. Cotter. Saw frames.—J. Jordan and A. Paul. Safety valves.—Alp. Helbronner. Improvements in sluices (com).—M. Collier. Looms for weaving.—W. P. Ayres. Construction of horticultural buildings.—C. D. Abel. Means and apparatus for conveying sewage and other liquid or partially liquid refuse from cesspools, privies, and other receptacles (com).

On December 14th.—3789 to 3801.—J. Lancaster. Hand sowing machine.—J. Musgrave. Steam boilers.—W. Anson. Breech-loading small-arms.—E. J. Flamand. Improved system of steam boilers and others with crossed pipes, called "Flamand's steam boilers."—J. B. Schott. New or improved cigar tube or holder. —A. Koettgen. Cooking and bakers' ovens. (Complete specification.)—W. Edwards. Rotary pumps.—J. Shanks. Water-supply apparatus for waterclosets, urinals, and washing and similar apparatus.—J. F. Clemow. Construction of lever horse hoes and lever corn drills.—J. Newton. Means of and apparatus for consuming smoke and economizing fuel.—S. Hickson. Preserving meat.—A. Helbronner. Construction of hydraulic foundations by means of tubes and without the aid of compressed air (com.)—J. Denis. Mechanism or apparatus for desiccating and reducing wood or other similar fibrous substances to pulp for the manufacture of paper, and in the means employed therefor.

On December 16th.—3802 to 3813.—W. Moseley. Governors for marine and other engines.—C. Baron de Malortie and J. E. T. Woods. Preserving fresh meats, game, fish, and vegetables by a new and tasteless process.—J. H. Spencer. Improved non-corroding watercloset apparatus, water-waste preventer, and overflow alarm.—J. Rendall and W. Rendall. Slop carts employed for collecting sewage and street refuse and carrying earth and manure.—R. Vagnolini. Obtaining and applying motive-power.—W. Baker. Heating apparatus for railway cars.—W. H. Bailey and J. Grindrod. Apparatus for raising, forcing, and measuring liquids.—S. W. Konn. Means and appliances for the production and maintaining of light by electricity (com.)—J. D. Sprague. Machinery for printing from engraved surfaces.—A. Rigg. Regulators of speed or power applicable partly to engines and partly to other machinery.—E. B. Ellington and J. H. Harrison. Hydraulic cylinders and rams working with variable power.—A. M. Clark. Artificial fuel (com.)

On December 17th.—(3814 to 3830.)—F. M. Green. Means or combination of instruments for producing manuscript copies of music.—O. Marland. Steam and other engine governors.—A. B. Brown. Hydraulic engines for discharging ships' cargo, parts of which are also applicable for other purposes.—E. Bainbridge. Mode and means of registering the number of vehicles or passengers on foot passing over a bridge or through or across any public or private thoroughfare, and the number of persons entering or leaving any vehicle, or building, or place of public amusement.—P. Fraise. Portable cooking apparatus. (Complete specification.)—S. Cornforth and J. Dangerfield. Machinery for pointing metallic rods and wire.—A. C. Henderson. Sewing machines specially adapted for sewing kid gloves, and capable of employment for other purposes (com.)—J. L. F. Target. Means or apparatus for receiving human excreta, and for distributing, deodorizing, or disinfecting powder over the same.—J. Kinsey. Liquid meters.—T. Welton. Application of natural permanent magnets to articles of wearing apparel or jewellery for curative and other purposes.—A. Prince. Hydro-oxygengas burners (com.)—H. W. Harman. Turrets for mounting heavy guns.—G. W. Rendel. Machinery for working heavy guns.—T. Neill. Printing floor cloths and in the machinery or apparatus employed therefor.—L. Vallet. Bottles and stoppers for the same.—J. F. Lackerstein. Manufacture of hydrogen gas.—H. Page. Manufacture of paper pulp or half stuff.

On December 18th.—(3831 to 3851.)—G. E. Magnus. Muro marble.—E. T. Hughes. Machines for making needles (com.)—T. Thorp. Equilibrium tap and self-closing bush valve, and the application of the bush valve to taps in general.—G. Duncan and W. A. Wilson. Production of stereotypes for rotary printing machines, and apparatus employed therein. —The same is the result of a (com.) made to them from abroad by G. Lauder, of Pittsburgh, in the State of Pennsylvania, one of the United States of America, and partly of their own invention.—R. H. Cotter. Steam engines.—W. W. Urquhart and J. Lindsay. Machinery or apparatus for calendering, mangling, or finishing woven fabrics.—J. S. Robertson. Horse-shoes for frosty or snowy weather.—J. Barton. Construction of furnaces.—J. Noad. Manufacture of electrotypes.—R. B. Boyman. Constructing ships.—R. B. Ladbury. Packing pins for sale.—H. Defty. Grips or fastenings for securing ropes or cords and tie bars.—G. Haseltine. Method of and apparatus for rendering and drying animal matter, deodorizing noxious gases, and treating blood to utilize it for agricultural and similar purposes (com.)—G. Haseltine. Sewing machines (com.) (Complete specification.)—L. Perkins. Packing rings for the pistons of steam engines, and in the wearing surfaces of slide valves and other wearing surfaces.—J. N. Lockyer. Estimation of metals.—F. Hawke. Obtaining press copies of manuscripts, and in the preparation of paper so as to render it capable of being employed therefor.—D. Ballantyne. Apparatus for the manufacture of spotted yarns or threads.—A. M. Clark. Improved calender (com.)—S. Ward. Machinery for seaming, turning off, and waling hosiery goods.—S. Holker. Treatment of straw, esparto, wood, and similar substances used in the manufacture of paper.

On December 19th.—(3852 to 3860.)—A. C. Henderson. Apparatus for filtering and defecating water by a radiation, in the mode of cleansing the said apparatus, and in its several applications (com.)—F. B. Houghton. Method of or process for treating spent hops for the manufacture of paper pulp.—N. Ager. Sashes and frames, and in apparatus for facilitating the cleaning, painting, and repairs of windows and sashes.—E. Whitehall. Apparatus for uniting parts of looped fabrics.—A. M. Clark. Ventilating ships or vessels (com.) R. Smyth. Feathering paddles for propelling ships or vessels.—J. Robinson and J. Smith. Machinery for shaping staves for casks.—R. H. Taunton. Joint for connecting the heads and caps of tubulous boilers. (Complete specification.)—R. B. Stewart. Method of covering treads of steps or stairs with the risers where necessary, and also floorings.

(Continued on Page 16.)

Scientific and Literary Review,
AND RECORD OF PROGRESS IN
ARTS, INDUSTRY, AND MANUFACTURES,
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JOURNAL OF THE INVENTORS' INSTITUTE.

FEBRUARY 1, 1873.

INDUSTRIAL ORGANIZATIONS.

The "wisdom of our ancestors" is a phrase in these days not too fashionable. Men have now become favourers of the Darwinian theory, and consider their progenitors mentally their inferiors—for this is in accord with the theory of development. If any institution or public custom is good, it is in consequence of having been acted on by modern reform; if bad, it is owing to its being untouched by any innovating hand. Nevertheless, we are surrounded by political and municipal institutions which are our pride and the envy of the whole world; amongst these trade guilds take no mean rank. Originating as associations of men following one common art or commercial avocation, they aimed at supplying a public want—the organization of industry—in the most comprehensive and practical manner. They were no mere trades' unions of the modern kind, associating the workmen for the maintenance of their interests, separate from that of their employers, for they embraced masters, workmen, and apprentices in one society, all working in connection with the ordinary magistracy of the country with the view to uphold the status and watch over the interests of each branch of industrials. Such was their pristine state, though their present position is, it must be confessed, but a shadow of that they formerly held. Some have died out altogether, and others have "a name to live but are dead," whilst a few are endeavouring, like the Turners' Company, to revivify themselves, and not altogether without some success.

It cannot be doubted by any observant person that institutions of the same general character as the ancient trade guilds are capable of doing as much good service to the country as they have in time past proved injurious to industrial progress. It is true they, having in former times been guilty of acting upon narrow views of sectional trading interests, limiting production and checking the growth of commerce, which, according to the system, they practically adopted was to be allowed to develop only in such a manner as appeared to each individual guild to be advantageous for its own interests. But between the two extremes of narrow-minded meddlesomeness and absolute non-interference is situate the *via media* of judicious intervention on all questions where the ignorance or cupidity of individuals or sections may be likely to be productive of injury to the entire craft or the whole industrial body.

Thus, to take the case as it at present stands, putting aside the advantages to the progress of invention as advancing trade which these guilds could offer, we have the evil effects of ignorance of technical science which exists amongst so many men engaged in industrial pursuits, as a matter requiring to be dealt with by the establishment of suitable arrangements for the promotion of technical education, and one which it should be the business of these guilds to take in hand. We have also the question of prevention of "strikes" and "lock-outs," which is clearly a work germane to their professed character and constitution—matters neither small nor merely sectional, but of the widest public importance.

It is clear, therefore, that there is plenty of work for the guilds to do, and work that promises much national advantage. This question being disposed of, another one has to be dealt with—namely, are the guilds in their present state equal to the requirements of the case, for as far as those of our metropolis are concerned, and they are the only bodies now existing (with a very few provincial exceptions) worthy of being taken into account in dealing with this subject. These bodies are for the most part composed of men who do not carry on the trade or vocation ostensibly organized in the guild to which they belong. But instead of regarding this state of things as an objection to the adaptability of the guilds, to the work referred to, it should be considered as advantageous to it, since they now possess bodies of men who, being outside the crafts or vocations they have to operate upon, will, it may be fairly assumed, possess no trade bigotry or narrow views as to the policy that ought to be pursued for the benefit of such crafts or vocations, and any technical or trade knowledge they may require they can readily obtain by recruiting their ranks by the addition of men who are actually practising the craft.

As definite propositions are always preferable to mere generalities, it may be desirable to present a few suggestions on this subject for the consideration of the public, and we cannot do better than place before our readers the suggestions made by Mr. Campin in his paper on Trade Guilds recently read at the Inventors' Institute.

First, then, these guilds should establish periodical exhibitions of works of art and industry, and should award money prizes and also the freedom of the company to the high-class prizemen.

Second, they should support free academies for instruction in technic science, and offer inducements to youths and others to become students in them by awarding prizes (freedom of the company to be amongst these) for technical merit, and even for regular attendance with orderly behaviour, for in the first instance at least it will be found that youths will have to be offered the opportunity of obtaining payment for attendance at these academies.

Third, the guilds should require that all their apprentices pass examinations in technic science, awarding them certificates and prizes if entitled to them.

Fourth, the guilds should form councils of conciliation for the prevention of strikes and lock-outs, and the regulation of the dealings of the members of the craft.

Fifth, they should award emblazoned testimonials to masters whose apprentices or workshop youths have obtained good prizes or certificates.

Sixth, each guild or group of guilds should award prizes for good practical inventions which have reference to the art or industry appertaining to such guild or group.

Seventh, for the better carrying out or these suggestions it is desirable that all those persons who are practising a trade or craft, but are members of another guild, should be admitted *ad eundum* to the freedom of the proper guild without cost if willing to serve on committees for promoting technical education and progression of the craft and councils of conciliation.

The indentures of apprenticeship to any such members of a guild who are following some other craft or vocation than that appertaining to the guild of which he is a member, should be notified by that body to that one to which his craft does appertain, and when the term of his indentures is completed, he should become a licentiate of the proper guild for his trade or art liable to serve on its technical committees and councils of conciliation. And any workman or apprentice, according to the discretion of the guild, should be admissible as licentiate of that guild.

The term licentiate as here used must be taken to mean that the person is certified as capable of carrying on his trade, and will not be hindered or molested by the guild belonging to the trade in so doing.

It must be remembered that in all these suggestions the guilds or companies of the City of London have been those principally had in view for the reason above adverted to, and it must be remembered that the members of these companies are not obliged to reside or carry on business in London, and that the jurisdiction of most of them extends beyond the City bounds, some even embracing all England. Further, that under the presidency of the Lord Mayor they can act in concert, and thus they might form local committees for some or all of the objects above referred to, and a national technical university, or what appears to be more desirable, a Royal academy of technology (to take rank after the present Royal academies), with affiliated institutes might be evolved from any such movement on the part of the London guilds.

Reviews.

On the Construction and Manufacture of Artificial Limbs.

By THOMAS WELTON, 13, Grafton-street, W., Fitzroy-square. London: Published by the Author.

ALTHOUGH this, like many other pamphlets now issuing from the press, is evidently intended as a means of advancing the author's professional interests, yet, as it affords some sound practical information on a subject of the first importance to those unfortunate members of the community who are compelled to resort to the use of artificial substitutes for natural limbs, we feel it a duty to humanity, as well as practical science, to notice this little work in our columns.

Though full of practical points, the following hint to the surgical profession is, perhaps, the most important one in the book:—

It is not intended in this small work to offer advice to the surgeon as to where it is best to amputate, as it would be insolent, for I presume that he knows his business best, and would not thank me for it, but I content myself by remarking, that if the leg be amputated too near the ancle joint, it is very difficult to fit an artificial foot to the stump. First, because it would not have sufficient flesh at the end to well cover the bone, and next, because the stump being long would occupy the space required for the ancle joint of the artificial foot, and be very unsightly when the leg is finished, as the ancle joint of the artificial should correspond with the natural foot. I know of such a case in Hammersmith, in which the patient underwent Chopart's operation, and no man in England can fit him so that he can walk with comfort; to try to do so, has cost him very many pounds. The instrument before described that I made for him, being very light, is the nearest fit, and the one he wears. I could cite other similar cases abundantly proving my observations.

Mr. Welton gives a brief history of the various patents that have been taken out in England for artificial limbs, with their dates, names, and numbers, which will doubtless be interesting to our inventive friends:—

In the year 1790, the first patent taken out for artificial limbs, is by Mr. Mann, No. 1724. The second, by Mr. James Potts, in 1800, No. 2448. I give an abridgement of the specification. "An artificial leg on a new or improved construction. A box or tube of bend leather is fitted to a wooden joint, several inches thick, in which there are stops to prevent its movement going beyond a certain point, and a lock which fits to the under lock of the knee, a piece of wood. When stuffed after the form of a natural leg, the lower end having a virl and ball (cup and ball joint) which are inserted into the brass sockets of the wooden foot, furnished with screw-nails, and nuts; the toes of the foot are also jointed and capable of motion." In another specification, the patentee claims the right of enamelling, japanning, or painting artificial limbs of a flesh colour. It can be clearly seen that the celebrated Bly leg, which received provisional protection only, is not an original idea, nor the much vaunted enamelling of it either, and, in fact, J. Pott's leg is a much more shapely one, if that be any advantage, than Bly's, though heavier in weight; but when it is taken into consideration that Bly's foot is weighty just where it should not be, it is doubtful if it be not the heaviest to wear, and indeed, the same may be said of the new American leg, with its mass of India-rubber in the foot. Three of my customers cannot wear them, though so much bepraised.

Does it not stand to reason, that the whole of the lower part of an artificial leg or foot should be light, to give the wearer a better chance to use it?

Mr. Bly also claims as new, an improved knee-joint for cases of amputation of the foot. His supposed improvement has been in common use by Mr. Grossmith, of Fleet-street, for several years past. See his show card as proof. Having said thus much without any desire to detract from any person's merit, but simply to state the truth, I think it would be as well to say that there are in common use two recognized artificial legs, one usually called the Anglesea, which consists of a wooden thigh case having ordinary mortice and tenon joints at the knee and ancle; both these joints have a hollow bolt passing through their centres. To give motion to the foot, a strong piece of gut is affixed to the heel, passes through the calf and is attached firmly to the back of the knee. India-rubber bands are also affixed, both to the front of the ancle and the front of the thigh case, to give the requisite motions to the instrument, which when well made is really a clever piece of mechanism, but needs attention, as does also a steam-engine, or any other machine subject to wear and tear.

The other one, named after the inventor, Mr. Palmer, is lighter than the Anglesea, cleanly in appearance, light to walk with, has a firm natural step, is japanned a flesh colour, and so can be washed and is much to be commended for its ingenious arrangements, especially of the foot, which is hollow, having a bolt connecting the foot and ancle joint which is so constructed that the heel fits into the back part of the leg, and the front part of the leg (at the ancle joint) fits into the front part of the foot hollowed out to receive it. This arrangement is very clever, neat in appearance, but of necessity weak, and, of course, liable to get out of order; and I may add that is its only fault; and now allow me to say, that the prying of the stump against the sides of the thigh case is not the result of the want of lateral motion of the foot as stated by Dr. Bly; but the absence of skill in the construction of the instrument (the result of misfitting in plain English), though I admit that his foot in that respect is anatomically right, but mechanically wrong, because of its weight in the wrong place as before stated. Having said so much respecting the artificial limbs now before the public, I continue the list of patents respecting them, so that without trouble any person may judge of their merits, premising that in my search I may have unintentionally omitted some.

Mann, 1790—No. 1724; Mann, 1810—No. 3398; Shand, 1816—No. 4039; Wilms, 1817—No. 4116; Brooman, 1849—No. 12,444; Mitchel, 1852—No. 204; Salt, 1855—No. 1220; Ashman, 1856—No. 1754; Jones, 1856—No. 2835; Newton, 1857—No. 750; Michæl, 1860—No. 675; Masters, 1862—No. 1862; Newton, 1862—No. 1185; Newton, 1867—No. 63; Brown, 1867—No. 2957; Bigg, 1868—No. 3973.

It is useless to review the whole of these patents; suffice it to say, that no doubt all of them possess merit as steps towards the right direction, still practice and acquaintance with the art proves which are best, and I have no hesitation in saying that the Anglesea leg is so, all things considered; but it often happens, that the workman in the exercise of his profession sees an improvement (and most commonly holds his tongue about it for evident reasons), that his employer fails to perceive, because their aims are different. The workman's heart is in his labour if he be a man at all; the employer's aim is how to increase his profits, and rightly too, providing they are fairly and honestly obtained.

Twelve Months' Experience with the A B C Process of Purifying Sewage.

A Letter addressed to a Shareholder in the Native Guano Company (Limited). By WILLIAM CROOKES, F.R.S., &c. London, 1872.

ACCORDING to Mr. Crookes the claims of the A B C process to public confidence are, in the opinion of its promoters, threefold.

I. It deodorizes and disinfects sewage, and precipitates the suspended and much of the injurious dissolved matter in it; without giving rise to any nuisance, it converts the deposit into a dry, portable, and inoffensive powder, possessing considerable manurial value.

II. It leaves the effluent water in a state of practical purity, fit to be discharged into any river.

III. It effects these important sanitary requirements at a cost, which not only relieves the ratepayers of expense, but even yields a profit, owing to the ready sale of the "native guano" at £3 10s. per ton.

Mr. Crookes examines the three statements *seriatim*.

First, the precipitation of the "native guano" from sewage. When I first heard of the process, the mixture of alum, blood, clay, and charcoal appeared irrational. I assumed, as most chemists would, that the alum did most of the work, that the charcoal might perhaps assist in removing smell, but that the clay and blood were, if not actually injurious, at all events inert. It was not until I had worked for some time both in the laboratory and on the large scale that I saw how judicious was the mixture which had at first appeared so incongruous. It is true that the alum or sulphate of alumina does a great part of the work. In contact with sewage—a slightly alkaline liquid charged with nitrogeneous organic matter—the alumina is separated in flocks, and by virtue of its remarkable affinity for dissolved organic matter each particle seizes hold of, and drags down with it, a corresponding particle of nitrogeneous impurity. The blood here comes into play; this is essentially a liquid highly charged with albumen; albumen is instantly coagulated in the presence of alum; and in the same way as this ready coagulability of albumen is utilized in fining wine and coffee, so it is made use of in this process by joining with the alumina in its precipitation, uniting it in a net-work of fibres, and giving it, as it were, arms wherewith to seize upon and drag out of the liquid still more putrescible constituents.

But the precipitated hydrate of alumina is light in character, and although it would ultimately settle, leaving a clear liquid above it, the slightest agitation causes it to float up, and thus renders it difficult, on the large scale, to drain off the mud. At Paris I have seen sulphate of alumina, *per se*, employed for clarifying several hundred thousand gallons of sewage; and among the many defects of this process, that of imperfect settlement was by no means the least. Here the action of the clay is apparent. This substance has a curious physical property; when finely ground up with water it forms a creamy emulsion, which takes many days to settle; many rivers, in time of flood, owe their turbidity to this cause; the Seine at the present time is a striking example, its water being in colour, although not in actual impurity, as bad as the Thames below London Bridge. But when this creamy liquid meets with sulphate of alumina, the clay coagulates like albumen, and settles down in heavy granular flakes. Now in the A B C process these three precipitations—that of the alumina, that of the albumen, and that of the clay—take place simultaneously, and in each other's presence; they become closely locked together in a triple alliance; the heavy character of the clay particles gives density to the mass, and causes it to settle rapidly, and remain in a compact form at the bottom of the tank.

Were the object merely to produce an easily dried precipitate and a clear effluent, nothing more would be required; for not only has this precipitate carried down all the suspended matter, but much of the dissolved nitrogenous and albumenoid impurities have fixed themselves on to the alumina, whilst the clay has also performed its part in absorbing and carrying down a good proportion of the ammonia. But there still remains the probability, if not the certainty, of foul gases being present, whilst the water, though clear, may nevertheless be coloured. These residual impurities are attacked by the charcoal; the powerful affinity of animal charcoal for organic colouring matter corrects the one evil, whilst the well-known absorptive action exerted by vegetable charcoal on the gaseous products of putrefaction corrects the other. Little more in the way of purification remains to be done.

By a modification in the order in which the purifying ingredients are added, these reactions, which I have explained somewhat fully, are effected at once, with a certainty of uniform results, whilst by a simple mechanical arrangement the exact dose of each constituent required by a variation in the strength of the sewage can be readily added.

The drying of the mud is more an engineering than a chemical problem, and a very tough one it seemed to be for the first six months of my connection with the Company. A most ingenious application of heat in revolving iron cylinders has, however, solved this difficulty. Wet mud is poured in at one end, and dry manure—in the form of an inodorous and inoffensive powder—falls from the other end, at the rate of 5 tons in 10 hours, at an expenditure of a few cwts. of coal. If space enough be available the mud may be simply pumped from the bottom of the settling tanks into large open-air tanks, where it gradually dries up under the influence of the sun and air; not the slightest offensive odour is apparent during any stage of this drying.

The second point which demanded attention was the state of the effluent water. As to this Mr. Crookes says:—It is perfectly limpid and colourless, and has no smell, and so little taste that were it not that the tasters know whence it comes they would not notice it.

Mr. Crookes next refers to manurial value, and finally concludes thus:—

I have, therefore, no doubt that under proper management the A B C process can be worked so as—

1. To deodorize and disinfect all collections of town sewage, solid or liquid.
2. To produce an effluent water fit to be discharged into any river.
3. To produce a dry, portable, and inoffensive manure, readily saleable to agriculturists at £3 10s. a ton.
4. To effect these without any nuisance, and at a cost of not more, and probably much less, than £2 a ton.

On the Advantages of Gas for Cooking and Heating. By MAGNUS OHREN, A.I.C.E., Past-President of the British Association of Gas Managers, Secretary of the Crystal Palace District Gas Company. London: Printed for the Author, by M'Corquodale and Co., 6, Cardington-street, London, N.W.

THIS little pamphlet is worthy of the attention of all those who are interested in the application of gas to cooking and heating purposes, as it contains several wood engravings, accompanied by explanatory remarks, which afford a considerable amount of information as to various stoves and apparatus which are now before the public, and is well worthy of perusal by all practical men, though the work is intended for distribution among gas consumers, and is to convince them, by a thorough investigation of the subject, that gas cooking and heating stoves are now brought to a state of great perfection, and may be used in lieu of coal fires, with much advantage. The requisite information is given to guide them in the selection of suitable stoves, and in districts where gas companies do not at present sell stoves or let them on hire, any gas fitter or ironmonger can supply those named in this pamphlet, *at the prices quoted;* but should any difficulty be experienced the makers will, on receipt of a post card, give full particulars of where and how the various apparatus may be obtained. The author says in the preface:—"Amongst other apparatus used or inspected by me may be noted, the "Cheerful Gas Fire" lately introduced from France, representing (by reflection) a blazing fire—this stove can be obtained through Milne and Son, of King Edward-street, London, and Edinburgh*—the stoves are made of various shapes, and of sizes *suitable for existing fire-places.* The cooking apparatus made by Green, of Western-road, Brighton. The "King of Bar Stoves," specially designed for taverns, refreshment bars, &c., made by Michel, of Oxford-street, London. "The Bath Stove," made by Phillips and Son, of Barbican, London, the original makers of gas baths. The "Kitchen Boiler Protector," patented by Waterson and Co., of Forest-hill, Kent—made by Hulett and Co., of Holborn, London—this gas stove is simple, effective, and cheap, any plumber can fix it—it prevents the exploding of kitchen boilers, and can be used to prevent the bursting of water pipes during frosty weather. And last, though not least to be noted, "The Self-Purifying Stove," just patented by Dr. Tayler, of Norwood, specially designed for warming the bed rooms of invalids—made by Hodge and Co., of Hatton Garden, London.

The author adds:—

Let me impress upon those who intend using gas stoves, that it is useless to go to the best makers, and get the best stoves, if the chief point, the quantity of gas recommended to be used with each description of stove, be not *rigidly attended* to, as *too much* or *too little* gas will prove a failure; for this reason I urge the use of gas regulators, and to insure a perfect supply, a regulator should be used to each stove. I find that for stoves consuming about five to eight feet per hour a lamp regulator (the same as used to regulate public lights) is quite sufficient. John Wright and Co., of Birmingham, at my suggestion, are fitting them to some of their stoves (at an additional expense of about 4s.), they are easily fixed, give the requisite quantity of gas under varying pressures, and are self-acting. Dry gas regulators of all kinds are made by William Sugg, of Vincent Works, Westminster, London, who will give consumers every information respecting them, if there be any difficulty experienced in getting them from local gas fitters. I recommend *dry* in preference to *mercurial* regulators for safety.

With well made stoves, and the supply of gas properly regulated, the use of gas stoves will soon become universal.

Cooking by gas, which now appears so easy, and is so satisfactorily accomplished, is the result of many years' experience; and it is only within the last two years that the cooking stoves, introduced by Mr. Ohren, have been in full operation in the district lighted by the company of which he is secretary, to the great satisfaction of a large number who use them; and it is to make known the value of these stoves, and extend the use of them, that this pamphlet is published.

Perhaps the most interesting part of this pamphlet is the description of a stove fixed by Mr. Leoni at the London Hospital, and which Mr. Ohren states gave astonishing results, the object to be attained being not how to obtain light, but *how to obtain most heat*, in a convenient form, from the least consumption, and the great secret of the process consists in burning the gas with a certain large admixture of atmospheric air.

As the comparative economy of the process is more strikingly shown on a large scale than a small one, I shall give some details of the apparatus at work at the London Hospital, and conclude with a report of Mr. Nixon, after about six months' experience of its use. The cooking for a large hospital is no unimportant element in the daily expense; it presents fair opportunity for comparing, not on speculation, but from carefully-considered data, *i.e.*, the record of a series of facts extending over a lengthened period, the result of certain processes which may be seen at work any day.

The number of dinners to be provided every day is about 650; but I have the authority of the "*cook*" for saying that, with the same apparatus, dinners daily for 1,000 people could be easily provided.

The kitchen of the London Hospital is, of course, in the basement, and the first and most important item of its requirements is the roasting apparatus; this is below the floor-line, and covered with a chequered plate, flush with the floor, so that while the dinner is cooking there is no evidence of what is going on, except a certain simmering sound, the temperature of the room not being above 60 deg. in ordinary weather. A more extensive application of the method of cooking is all that is required.

The diameter of the cylinder is four feet internally, and five feet externally. On the day of my visit 239 lbs. of meat had to be roasted; the joints were suspended on horizontal spits to a light wrought-iron frame, and at twelve o'clock, after exactly two hours in the stove, the lid was raised, the crane turned round, and the frame, with the joints perfectly cooked, quietly lifted from the cylinder, and carefully weighed to ascertain the per-centage of waste in cooking, as they were previously weighed before being "put to roast"—a few minutes only being required for the operation. A small iron staircase leads down to the dripping-pan, which, of course, has to be cleaned every day; but, with this exception, the whole of the work is done at the floor level. An apparatus of this size will roast 5 cwt. of meat in two hours, if required. There is an ingenious arrangement for a single or double supply of gas; the double supply is used in the earlier part of the cooking, and the single one afterwards. The consumption is about 250 ft. in two hours.

In case of small roasts being required, there is above the floor, and somewhat resembling an iron safe in its outward appearance, a double roasting cupboard, 6 ft. high, in two heights, each height having its separate gas-ring, in which a few joints can at any time be cooked in case of need.

So much for the roasting: now for the boiling, frying, and baking. The two first of these processes are conducted at an adjoining hot-plate, with what may be termed "open gas fires," fourteen in number, and varying from 12 to 8 in. in diameter. They are combined in an iron frame 8 ft. long, 2 ft. 6 in. wide, and 3 ft. high; the products of combustion are removed in this case by flues of wrought iron into a common chimney. Upon the openings in the top plate of this gas stove, as it may be called, any number of boilers, kettles, or other vessels may be placed, and the heat can be regulated according to the work to be done, each circular opening having a double ring of gas jets, the inner and outer circle, each controlled by a separate tap; ten of the fourteen openings are thus double, the remaining four smaller and single. *Broiling* is done by reflection, with similar arrangement of burners; a series of six trays, each 20 in. by 12 in., sliding in a few inches under the gas-rings. Each of these trays will cook twenty chops, if required, in the course of a few minutes.

The baking is done in the oven adjoining, specially constructed; but in this case the gas-ring which runs all round the sides of the pair of square ovens, each 6 ft. high, 3 ft. wide, and 3 ft, deep, is about 2 ft. below the pies or other dishes to be baked. The pies are arranged on a series of five wrought-iron open light shelves, which occupy the upper portion of the 6 ft. in height, to which these ovens extend. About fifty pies at a time can be baked in each of the two ovens, the time varying, of course, from that required for meat pies to the few minutes necessary for light puddings, but all these details are matters of absolute practice and calculation. In all these cases ample provision is made for removing the products of combustion without loss of heat.

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* I find that these stoves are now manufactured in England by Messrs. Wright and Co., of Birmingham.

As an intermediate application of the principle, I might instance the Governor's house at the London Hospital, where the same apparatus is employed in a modified and combined form, suitable for a large private residence, mansion, or hotel. The dimensions are 5 ft. long, 3 ft. high, and 2 ft. deep, and might cook a dinner for 100 people.

Prize Essay on the Balance Spring and its Isochronal Adjustments. (Baroness Burdett Coutts's Prize.) By MORITZ IMMISCH. London: E. and F. N. Spon, 48, Charing Cross. New York: 446, Broome-street.

THIS is an essay well worthy of the prize it obtained, and we cannot do better than let the author speak for himself. He truly says:—The Balance Spring has often been called the soul of portable time-measuring instruments, and anyone at all partial to figurative language will own that it fully deserves the appellation, inasmuch as from its importance, delicacy, sensitiveness, and independence of action, it may well be likened to the predominating mind, which, though it derives its sustenance from the body, governs in its turn all the actions of the latter. Watchmakers are all the more tempted to make a comparison of this kind on account of the uncertainty under which the majority of them labour with regard to its properties and the laws which govern its actions.

One can scarcely be surprised at the prevailing ignorance in this respect, as there is very little reliable information to be found in books on watchmaking which could at all serve as a guide, and as a sound base for self-improvement.

The principal aim of watchmaking is correct measurement of time, and it must be confessed that in this respect, judging from the average performance of what are called first-class watches, there is ample room for improvement. There is no doubt that a proper knowledge of the nature and correct adjustment of the balance spring, especially with regard to isochronism, is of the utmost importance.

This manifests itself very strikingly, when we see that frequently a watch or chronometer of inferior make and even faulty construction goes admirably, and with a regularity which in some cases is perfectly astonishing; while, on the other hand, the highest degree of perfection of the escapement, the most exquisite finish of the trainwork, is unavailing to produce good performance if the balance spring is faulty or imperfectly adjusted.

It is to the introduction of the balance spring that watchmaking as an art may be said to owe its very existence.

There certainly was a kind of watch made before its invention in which the vibration of the balance was kept up by the recoil it met with in the escapement, the momentum of the balance being alternately destroyed and renewed solely by the direct operation of the motive force. This mode of obtaining a vibrating motion was no doubt extremely ingenious, but it is evident that any of the unavoidable irregularities to which the available impelling force of the fly-wheel is always subject would tell immensely upon the balance, modifying its speed to such an extent as to make these watches next to useless for practical purposes. The principles upon which these machines were constructed, precluded the possibility of their being materially improved, and they would have remained, what in fact they were then, objects of curiosity rather than of utility.

It was reserved to the genius of the celebrated Dr. Hooke, who in the middle of the seventeenth century discovered the use of the balance spring, to supply the wanting elements of perfectibility, and to raise watchmaking from its primitive state to the rank of a beautiful and beneficial science.

His keen intellect perceived at once the immense advantage of giving to the balance an independent motion of its own, by means of which it was enabled to exercise a proper control over the irregularities of the motive force and to neutralize their effects. His scientific investigations of the nature of springs, and his inquiries into the laws that govern their action, led him to his celebrated maxim, "*ut tensio sic vis*" (the force of a spring is as its tension), that has made his name famous for ever. With a view to solve the problem of determining the longitude at sea by means of a correct timekeeper, he applied for a patent; it was not carried into effect, however, on account of a serious disagreement between him and some enterprising gentlemen of position, in conjunction with whom the Doctor intended to work the patent at first, and he determined to leave the matter dormant for a time. It soon transpired, however, and "pendule watches" were made by several watchmakers in London soon afterwards. We find, too, that later on, several French watchmakers were quarrelling amongst themselves about the priority of the same invention, but this can only mean the priority of application, inasmuch as from documents still existing it appears that some of them had been in communication with the same parties who had failed to come to terms with Dr. Hooke, and it is more than probable that they suggested the idea to their French correspondents.

Considering time and circumstances, the beautiful combination of balance and spring must be put solely to the credit of Dr. Hooke.

Applied to the old verge escapement, the difficulties in the way of good performance were still very great on account of the recoil; but as this could now be dispensed with as a means of bringing the balance after a first impulse back into a proper position to receive the next, the idea of dead-beat escapements suggested itself, and Hooke contrived one which, though it had still a slight recoil, contained the elements and was suggestive of the duplex escapement which was invented some fifty years later by Dutertre, a French watchmaker.

In the course of time a good many of these escapements came into existence, but it was not until the free detached escapements made their appearance in the latter part of the eighteenth century, that the real properties of the balance spring could at all be tested with any chance of arriving at some definite conclusions.

Before that time the greater or lesser friction of the acting parts of the escapements continuing throughout the whole of the vibration made it a matter of great perplexity to reconcile the results actually observed with Hooke's "*ut tensio sic vis*," and as the theories founded on experiments with one escapement were at variance with the results of experiments made with another, we cannot wonder that the opinions concerning the spring were undecided and sometimes contradictory.

As an instance illustrative of the extreme difficulties in the way of properly understanding the conditions under which the balance spring acted, I may mention that in 1766, more than a hundred years after Hooke's invention, Cummings, in his book "Improvements of Watchwork," describes a dead-beat escapement, and in experimenting with it finds that its behaviour in long and short vibrations was so different to what it was with other escapements that he comes to the conclusion "that hitherto the effects of the maintaining power have been mistaken for the natural tendency of the pendulum spring."

(To be continued.)

Gregory's British Metric System: A Complete Non-Decimal Assimilation of the British to the Metric System of Weights and Measures, Retaining their Present English Names. The Two-Foot Rule made Metric, with Metric Duodecimals; Equivalent International Prices, without Decimal Coinage. For Adoption in Great Britain and the United States, the British Colonies and India. By ISAAC GREGORY, Principal of Merchants' College, &c. London: Cassell, Petter, and Galpin; Paris: Hachette, et Cie.

THE object of this work is to present the public with a practical plan of rendering our weights and measures metric, and to afford the advocates of the metric system ready means of facilitating its practical introduction. The work contains full descriptions of the New Metric Measures, British Metric Tables, Comparative Metric and Imperial Measures and Equivalent Difference in Price for Difference in Measure, Comparative Quantities in the Tables, Dissertations on Prices, Pieces of Goods, "Picks" or Threads, as affected by the Metric System, and on Arithmetic and Metric Coinage—The Weight of the Sovereign. On Gross Weight, Nomenclature, Series of Weights, Examples in Gross and Jewellers' Weights, Series of Liquid and Dry Measures, Dimensions of British Metric Measures; the Centner, Bushel, Quintal, Quarter, Remarks on Examples in Liquid and Dry Measures, Equivalent Prices—British and Metric. And as to Metric to English, English to Metric Money. The Two-Foot Rule metricised is described by reference to an Illustrative Diagram and Equivalent Measure, the Metric Two-Foot Rule and Metric Duodecimals, with Examples, Metric Square and Cubic Measure are fully discussed.

The following statements as to the origin of the Metric System will interest many of our readers:—

The animated discussions arising from the opinions first expressed by Sir Isaac Newton, that the earth became flattened towards the Poles, caused the scientific men of France, under the direction of the great Colbert, not only to examine and verify Sir Isaac Newton's opinion, but to propose a new measure of length. Mouton in 1670, and Cassini in 1718, suggested a decimal division of a terrestrial degree, as a unit of length. In 1766, commenced in France the first serious step towards the uniformity of weights and measures, required in France for so long a period, and still urgently required in Great Britain. A decree of the National Assembly of France, 8th May, 1790, urged the King of France to concert with the Government of England for a *réunion* of scientific men to make investigations, having for their object the deduction of a natural and invariable standard for all weights and measures.

Political events, war, and unfortunate national animosities prevented our concurrence; but, under the Academy of Sciences, a European commission was formed and committees, consisting of almost all European states except Great Britain, assembled. They carried on the work from the 24th June, 1792, under Mechain's and Delambre's leadership, and after seven years' laborious work, the two appointed committees completed their labours. The commission, composed of twenty-two scientific men, as many foreign *savants* as French, fixed upon the ten-millionth part of the distance from the North Pole to the Equator, as the great unit, to be called the meter. Lenoir constructed the various standards of length; Fortin constructed the unit of weight; and Lefevre-Gineau the unit of volume. The metric system was declared legal on the 10th December, 1799. It was rendered obligatory and exclusive in 1801, but the Government, owing chiefly to their having changed the old nomenclature entirely, and their not having taken any steps to convince the popular mind of the equivalent differences in money and quantity between the old and new measures, the new system made little progress. The law of 8th February, 1812, permitted the manufacture and use of non-metric weights and measures, based upon the new system. These are still much used in France, although since January 1st, 1840, the metric system, only, is exclusively obligatory. The nomenclature of the metric system has proved a constant misfortune. The popular mind prefers monosyllables to and distinctive names for measures; the pedantic polysyllables of the new system have, therefore, always obstructed its progress and popularity. Moreover, the coinage was changed at the same time, and it is self-evident that fractions of a unit of weight and measure, at fractions of a unit of money, was, and is, an unfortunate combination. For example, 25 centimeters of an article for 30 centimes would disturb a mind to which both centimeters and centimes were equally strange.

Mr. Gregory deserves the thanks of all rational men for this very practical effort to reduce our present chaotic system to a reasonable condition.

The Mineral Surveyor and Valuer's Complete Guide; Comprising a Treatise on Improved Mining Surveying, with New Traverse Tables; and Descriptions of Improved Instruments; also an Exposition of the Correct Principles of Laying Out and Valuing Home and Foreign Iron and Coal Mineral Properties: To which is Appended the Second Edition, Carefully Revised, of M. THOMAN'S (of the Société Credit Mobilier of Paris) Treatise on Compound Interest and Annuities, with Logarithmic Tables. By WILLIAM LINTERN, Mining and Civil Engineer. With Four Plates of Diagrams, Plans, &c. London: Lockwood and Co., 7, Stationers' Hall Court.

THIS is a most useful practical work, containing much general and technical instruction as to Paper for Maps, Dividing and Lining the Paper, Meridional Lines, the Chain, Chaining, &c., the Field Book—Entries, Points, &c., Traversing, the Travers Tables—their Construction and Application, Improved Dial and Protractor, Plotting the Survey, the Business and Application of Surveying. On Triangulation, &c.; on the Valuation of Mining Properties, and on Traverse Tables.

A Budget of Paradoxies. By AUGUSTUS DE MORGAN, F.R.A.S., and C.P.S., of Trinity College, Cambridge. Reprinted, with the Author's Additions, from the "Athenæum." London: Longmans', Green, and Co.

IT would be superfluous to do more than notice the publication of this work. The late Professor De Morgan's high reputation is so wide-spread, and these particular works of his must have already become so well-known in their serial form, that nothing is left for us to do but to chronicle the issue of the book from the press; but we may add that every man of science ought to have a copy of the work in his library.

Lectures on the Philosophy of Law; Together with Whewell, and Hegel, and Mr. W. R. Smith. A Vindication. By JAMES HUTCHINSON STIRLING, F.R.S.S., and LL.D., Edin. London: Longmans, Green, and Co. 1873.

THIS is a small book containing a *resumé* of nearly all that has been said, and can be said, on this subject, very interesting though metaphysical it be. Our space, however, will not permit us to review its pages in detail, therefore we must refer all who feel interested in the matter to the work itself.

The Astronomical Almanack for 1873. By H. W. HOLLIS, PhD., F.R.A.S. London: Simpkin, Marshall, and Co., Stationers'-Hall Court; Newcastle, Staffordshire: D. Dilworth. 1873.

THIS is a little work that will be found very useful to all interested in astronomy. In it the following particulars are given for every day in the year:—The Equation of Time—Sidereal Time at Mean Noon—Moon's Age at Midnight—The Configuration or Position relative to each other, and to the planet of Jupiter's satelites (when visible)—and many other matters of interest to astronomers.

Songs for Sailors. By W. C. BENNETT. Henry S. King and Co., Cornhill.

ENGLAND is rich in sea songs, and some of them of the very highest order; and these may take a prominent position amongst them, for they are sensible, manly, and spirited. Dibdin's, which are, perhaps, better known than others, are for the most part not songs for sailors, though many of them possess every good quality requisite in such effusions. In their rhyme there is the measured roll of the ocean, and in their natural *abandon* the freshness and vigour of the sea breeze. There are many single compositions, however, such as the "Arethusa," by Prince Hoare, which are far greater favourites with our sailors than even the best of Dibdin's. Mr. Bennett's little volume just published is really an admirable effort to give to the glorious deeds of our sailors an affectionate place in the memories of our people. It is a pleasure to sing about what we love, and, as a rule, we love what we sing about.

Harold Erle. A Biography. By WILLIAM A. GIBBS. Provost and Co., Henrietta-street.

THIS is a second edition of Mr. Gibbs' poetic love story; and it may be taken as an indication of an improved public taste that this new issue of so unpretending, yet so interesting, a volume has been called for. "Harold Erle" is noticeable for its want of resemblance to the most pretentious poetry of the day. There is in it no violent situations, no widely abrupt transitions, no bewildering, half insane rhodomontade. On the contrary, the story begins quietly and proceeds to its termination quite naturally, depending entirely for its interest on the truth to life and nature with which it is worked out, and the beauty and appropriateness of the language and images employed. We could quote many passages to justify this judgment, but like some of the very best poems we possess, no single part can give an adequate conception of the whole as a pleasing, graceful, and able performance. The blank verse flows naturally and easily, and the few lyrics scattered here and there through it make known the power of the writer, and beget in the reader a regret that Mr. Gibbs does not more frequently give us an opportunity of enjoying such gems of song as this volume contains.

Memoirs of Baron Stockmar. By his son, E. VON STOCKMAR. Translated from the German by G. A. M. Edited by F. Max Muller. 2 vols. Longmans.

To those who like to look from the social side of our politics into the minor mysteries of political life, this pleasant book will afford considerable help. Baron Stockmar, born in 1787, became a skilful physician, and in that capacity was employed by Prince Leopold, of Coburg, to attend on his person as medical adviser. Being personally respected and much trusted by his master, who had been chosen to fill the throne of Belgium, he became the chief adviser of that sagacious sovereign, and was ultimately commissioned to the English Court as the confidential adviser of our Queen—not then married. Being a thorough German, he did all in his power to promote the union of the young Queen and Prince Albert; and when the Queen had notified her approval of the Prince, Stockmar set about fitting him for the new honours he was about to receive. He remained many years at the English court, and only retired when age must have made such a life troublesome. He seems to have been an honest, good-natured man, who, notwithstanding his knowledge of Courts, never lost a hearty trust in his fellow creatures, nor did he at any time allow himself to doubt that his native country, by a wise unity, would some day become one of the foremost nations in the world. The life of this observant and honest courtier furnishes a great variety of topics for consideration, and by his correspondence occasional side-lights are thrown on obscure passages in contemporary history which add much to their interest. Amongst other things he deals very minutely with the struggle in the House of Commons between the Liberals and the Tories as to whether the annual allowance of Prince Albert should be £50,000 or £30,000 per annum. The Tories, through the bad management of the Whigs, as Baron Stockmar thinks, succeeded in striking off the £20,000 moved against by Colonel Sibthorpe, and thus set an example of economy which is more than likely they have not been very proud of or anxious to follow since. However this may be, there is much in the Baron's book which English readers will find it pleasant to run through, whilst to the political student it will be of great value as a key to open the way to a consideration of Court politics, useful in helping the study of those weightier questions of national policy which occupy the attention of statesmen and politicians.

A Lady of the Last Century. By DR. DORAN. Richard Bentley and Son.

THIS is really a most interesting volume, and in certain senses instructive. Mrs. Montague, who is the subject of it, lived at a time when the oddest people were in the habit of meeting together on some common ground of intellectual or social fitness, and when modes of thought, expression, and fashion prevailed, which, when brought under the notice of the modern reader, as in this book of Dr. Doran's, interest and sometimes astonish those who have not, to some extent, studied this period of our history. The literature of Charles the Second's reign, nay, even far into the time of the Georges, read in connection with the life of Count Grammont, Pepys' and Evelyn's diaries, and the never-to-be-omitted Boswell's Johnson carries us over a period which we do not look back upon with any great pride or pleasure. The national intellect was low; morality, in the higher circles especially, depraved; manners coarse; and altogether it may be said with truth that there never was in the history of England a time when the positively degrading vices of life were so openly practiced and so generally countenanced.

Mrs. Montague was not born till 1720, and was not brought up so much with reference to the accomplishments of a fine lady as in the society of learned and thoughtful men—amongst others Dr. Conyers Middleton—and by listening to these, that she might repeat to Dr. Middleton the best points of the conversation after their meetings had terminated, her mind became stored with a kind of knowledge which few women have opportunity to acquire. With all the advantages of fortune as well as personal beauty, it is not to be wondered at that the charming Miss Robinson was much sought after by elegible gentlemen, who, though they might care little for her many accomplishments, were smitten by her beauty, and probably stimulated by the fair monetary prospects of the clever young lady. The correspondence extracted from in these pages begins in 1734, when Miss Robinson was fourteen years of age, and a very sharp and observant mind it indicates on the part of so young a person. As she advanced in life, a gradually increasing knowledge of the world gave considerable point to her clever remarks on the people she met with, and from this book alone her odd observations on a variety of subjects carelessly thrown out to her various correspondents would make as pleasant a collection as could be culled out of Sam Rogers or Crabb Robinson. Describing society at Bath when in her 20th year, she declares it consisted "all the morning of 'How d'ye does?' and all night of 'What's trumps?'" She mentions an old dowager Duchess who nearly drowned a lot of lady bathers; as being tall, she ordered the bath to be filled till it reached her chin," so that the others had to fly to save themselves. Writing of the officers, or "scarlet beaux," ordered for Flanders, she says—"I think they will die of a panic, and save their enemies' powder. Heaven defend the nunneries! I will venture a wager Flanders increases in the christenings more than in the burials of the week." There are a few more jokes of this kind; but as they only passed between young ladies we shall not meddle with them. The following is shrewd, praccical, and pleasant, coming from a girl not yet twenty:—"I wish some of our neighbours had married two and three years ago, we should have had a gallant young neighbourhood; but they have lost time, and we have lost lovers by that delay." The following reflection is also sound: writing to her sister, who had joked her on her love of the heroes of antiquity, she remarks—"A living man is better than a dead hero."

When twenty-two she married Mr. Montague, a rich coalowner, and a clever man, though somewhat older than herself. This marriage was very happy, except in the matter of issue. They only had one child, and it died young; but not till Mrs. Montague had proved what a sweet motherly nature she had, and how fit she was to perform for her offspring every requisite duty, notwithstanding her great learning and ability. The affectionate husband and wife did their best to make up for their loss by their unremitting affection for each other, besides which he stuck to his mathematics and his coal, whilst she kept her eyes open, noted what was passing, and sent here and there to her correspondents the sharp shafts of her wit as comment on whatever particularly attracted her notice. Speaking of her own sex, she says, "So strong in women was the desire to please, each would have that happy power confined to her own person." Her description of Queen Charlotte, the bride of George III., given to her by Miss Arnold, is by no means flattering, especially this little touch—"Her mouth fills a great part of her face." This is deliciously feminine. The following is from her sister, Mrs. Scott, and refers to a matter which comes up occasionally, even yet in our political struggles:—"We make nobility as fast as people make kings and queens on Twelfth Night, and almost as many. Lady Townshend says she dare not spit out of her window for fear of spitting on a lord." The following electioneering story is not bad:—Lady Strathmore, at Newcastle, "sits all day in the window at a public-house, from whence she sometimes lets fall some jewels or trinkets, which voters pick up, and then she gives them money for restoring them."

In 1775, when Mrs. Montague was fifty-five years of age, her husband died, leaving her rich, and completely her own mistress. After this she lived in town and in country at her ease, writing letters as usual, doing good to her friends, and playing the hospitable hostess to men of wit and learning. She had literary breakfasts in Hill-street, to which the most celebrated men of the day resorted. Few lives, on the whole, could have been much pleasanter than that of Mrs. Montague; and when she laid it down in the year 1800, at the great age of 80 years, she certainly did not leave behind her many so fitting to bear the title under which she figures in Dr. Doran's book as "A Lady of the Last Century." We can very heartily recommend this work, both for matter and style.

The Fortnightly Review. Chapman and Hall, Piccadilly.

THIS "Review" is the most serious, earnest, and important of all our monthlies, and may, therefore, claim for itself an attention commensurate with the seriousness of its aims. The men who write are able, and, as a rule, deal with questions beyond the power of our ordinary run of magazine writers to handle profitably. Whether its readers agree or not with the view put forth on the many questions discussed by the "Fortnightly," they cannot but admire the sturdy spirit and great ability with which they are maintained.

The present number contains several able articles, notably the first by Frederic Harrison on the "Revival of Authority." His attack on politicians for undermining the principle of authority for party purposes is wonderfully well done, but, in granting the propriety of governing by capacity, we do not see so clearly, nor does Mr. Harrison show us satisfactorily, how we are to succeed in landing the right fish, however anxiously and carefully we may throw our line. To ask for the wisest and best is one thing, to get the right answer quite another; and so far as we can see Mr. Harrison has not pointed out a better mode of finding them than that in use, though we are quite willing to admit it is not so successful as we should wish it. The article by John Stuart Mill on "Grotes Aristotle," is, as might be expected, ably and clearly written—in fact, these two articles, were there nothing else worth notice, would make the current number of the "Fortnightly" a valuable contribution to the literature of the country.

The Metropolitan Weekly and Provincial Press. By JAMES GRANT. George Routledge and Sons.

THIS is a work of much elaborateness, but we are disposed to think of very slight value. Mr. Grant has heaped up piles of what he calls "facts," which are, for the most part, haphazard statements, such as any gossipping "picker up of unconsidered trifles" might sweep into his bag. Were such a work, as in this case, has been done so clumsily, and with scarcely a trace of intellectual discrimination, performed in an able and judicious manner, it could not fail to be most interesting and instructive. The growth of the newspaper press in England, illustrated by the lives and labours of those who stimulated it, would be a history explanatory to a great extent of the intellectual, moral, political, and industrial growth of the nation. This is not to be done inthe way in which Mr. Grant has performed his task. In aiming at everything he has actually done little; and he breaks down utterly in his attempts to develope the spirit that gave form and direction to this great work, through his partiality for describing the mere outside and most vulgar characteristics of newspaper management, and the literary labours connected with it. For such a book, which treats almost exclusively of supposed "facts," if we simply find a mere record of statements, made with the least possible regard to exactitude, it ceases at once to have any claim on the respect or attention of the reader; and unfortunately for Mr. Grant, one of the very first statements he makes is not only blundering and clumsy in the way in which it is put, but utterly wrong in its facts in regard to the papers to which it refers. He tells us that Wm. Gifford was editor of the *Anti-Jacobin*, which is quite true, and that he operated on "Peter Pindar" (Dr. Walcot) with his literary scalping-knife; that in consequence of this the Doctor rushed after him into the shop of the publisher in Piccadilly with the view of cudgelling him, and was bundled out, and rolled into the mud by the bystanders. But the funny side of this matter. according to Mr. Grant, was, that it was not William Gifford, but a Mr. John Gifford, who wrote the lampoon, and that it did not appear in the *Anti-Jacobin*, but in the "*Anti-Jacobin Review*—a weekly journal which had been started contemporaneously with the *Anti-Jacobin*." Why Mr. Grant should tell us first that it was William Gifford who did the lampoon on Peter Pindar in the one paper, and then immediately after inform us it was John Gifford who did it in another paper, he, perhaps, knows best. What we complain of, however, is that his "facts" are altogether wrong. The *Anti-Jacobin* was started in November 1797, and died in 1798, and was published weekly; and that William Gifford did write the attack on Dr. Walcot, and that that attack is printed in Gifford's works. Whereas, the *Anti-Jacobin Review* was a monthly magazine, which did not come into existence till July 1798, and was continued for many years; and in its first numbers was illustrated by some of the most characteristic and vigorous political caricatures of Gilroy. This is a specimen of Mr. Grant's accuracy; as to his tediousness, those who have time and inclination to wade through the book can easily find it out for themselves. It is but justice, however, to say, that nobody could have put together the mass of unimportant matter this volume contains without being dull, so that the tax imposed on the patience of the reader cannot be considered as entirely the writer's fault.

Boscobel; or, the Royal Oak. By W. HARRISON AINSWORTH. 3 vols. Tinsley Brothers.

HOW many of our present race of novelists will be read by the next generation of those who haunt circulating libraries?

This question is not so difficult to answer as at first sight it may appear: though prudent critics would be worse than foolish if by attempting an answer they laid themselves open to the attacks of those to whom they might hint the fate of forgetfulness. Mr. Harrison Ainsworth is not one of our worst writers; old readers cannot easily forget the stirring life of "Rookwood," nor with all its faults, and they are grave and many, can anybody say with justice that "Jack Sheppard" does not possess ability and interest, though of a coarse and startling kind.

We need not refer to the many books, some better some worse, given since these his earliest efforts, to British readers by Mr. Harrison Ainsworth. But we do feel disposed to ask why he should have taken the trouble to write "Boscobel?" What between Mr. Froude and his Irish squabble, and the rival theatres, we are absolutely getting sick of the first and second Charles and all belonging to them. We do not, nor can anybody care a staw for the wretched stage figures of Mr. Ainsworth's "Boscobel" volumes with their meaningless cant exclamations. Our English royalists were some of them chivalric—though, as a rule, they knew very well the value of money—whilst our Roundheads, in a very keen, practical manner, found out how to make the best of both worlds; there were, nevertheless, heroes in those days—men who acted nobly and suffered willingly; but in Mr. Ainsworth's romance, this noble and patriotic side of our English life has not been brought out, and when he sprinkles his pages with such phrases as "odds fish," "adzooks," "zounds," "si'death," and with Roundhead slang to match, we care nothing about the thing, and throw the whole aside as more uninteresting than Master Peter's puppets when the show was over.

Memoir of Nathaniel Hawthorne. With Stories. Now first published in this country. By H. A. PAGE. Henry S. King, and Co., Cornhill.

THIS book has been denounced in very unmeasured terms by a literary contemporary, who assures us that the whole thing, as regards the matter as well as the mode of its publication, is an injury, and it may be said an insult to the relatives and representatives of Mr. Hawthorne. Of this we know nothing, and cannot, therefore, enter into the merits of the case, but in perusing the contents of the volume we by no means feel disposed to endorse the condemnation to which we have alluded.

The writer is evidently a strong admirer of Hawthorne, and certainly in publishing this sketch of his life could have no intention of injuring his character as a man, or his reputation as a writer. There is really nothing in the volume which any ordinary enquirer might not have found out without much trouble, just so much as is usually known of any man whose fortune, or misfortune, it may be to attract public attention by his writings or acts. What we find fault with in this book is a flippancy of tone, which, whilst it professes to deal with the inner impulses and movements of Hawthorne's rather peculiar idiosyncrasy, really only touches his mental peculiarities in a very superficial manner. Still what is said is pretty well said, and will, no doubt, have the effect of sending many readers to Hawthorne's books with a view of judging for themselves. A great deal is said for a man who gave himself almost entirely to the writing of tales, when readers are assured that he possessed a genius worth studying. The specimen stories given furnish some justification of the praises contained in the life, but to understand Hawthorne, a full study of what he has done is absolutely requisite. Light trifles hurriedly thrown off never represent the serious work of a gifted writer's life.

HONOUR TO INVENTORS.

We learn with pleasure, says the *Mechanics' Magazine*, that a portion of the New York Central Park has been selected for the location of memorials to the inventors of all nations, and that one of these memorials is to be erected to Elias Howe, "the Inventor of the Sewing Machine." The good fortune to bestow equal benefits on mankind is reserved to few inventors, and a large share of the legacy has fallen to our countrymen. While all classes have been benefited, the object appeals especially to the sympathies of the inventive class, of which Mr. Howe was an illustrious representative. The estimated cost of the memorial is fifty thousand dollars—ten thousand pounds. The committee of the memorial fund, formed in this country, includes among others, Sir William Fairbairn, Bart., Bennett Woodcroft, F.R.S., Donald Nicholl, Esq., P. Le Neve Forster, M.A., Thomas Webster, Q.C., F.R.S., George Haseltine, LL.D., David Chadwick, M.P., and William Muir, C.E., Dr. Charles W. Siemens, F.R.S., and other eminent inventors have tendered their co-operation. The composition of the committee indicates general interest in the movement, and is an earnest of its success. Truly, the victories of peace are nobler than the victories of war, and the veneration of the heroes of these victories illustrates the spirit of modern civilization.

RAWCLIFFF, BIBBY, AND FLEMING'S IMPROVEMENTS IN SPINNING MULES.

This invention consists in fixing on the radial arm used in spinning mules, a lever oscillating on its centre, instead of being simply hinged to such radial arm. One end of this lever carries the ordinary stud or pulley used for tightening the winding-on chain, the other end of the lever is jointed to a connecting rod, the opposite end of which swivels on a travelling stud moved by the common ratchet wheel and catch, and mounted in a frame firmly secured to the floor or the framing of the headstock of the mule. The gradual moving of this stud, starting from a point nearly in a line with the centre of the quadrant at the commencement of the cap where no tightening of the winding-on chain is required, imparts to the oscillating lever on the radial arm a continually increasing motion throughout the working of the cap, the amount of which motion can be so nicely adjusted as to compensate for the gradually diminishing diameter of the spindle as the cap progresses, and without the slightest strain upon the yarn, at the same time the use of springs to raise the lunged lever out of the way of the carriage is dispensed with, as is also the sliding hooked rod for pulling the lunged lever by substituting a connecting rod vibrating on fixed centres by means of which the oscillating lever on the radial arm is raised out of the way of the carriage, thus removing all liability to accident, and imparting a much steadier motion to the tightening stud on pulley.

ASBESTOS STEAM PACKING.

The marvellous properties and consequent prospective value of Asbestos to mankind have been known to some extent and appreciated for thousands of years, and much money has been expended in endeavours to make it available; but up till within a few years these experiments have for the most part resulted in failure. However, the plan now being carried out by the Patent Asbestos Company at Glasgow, claims to have accomplished the desired effect. The raw material is brought to their manufactory in considerable quantities from different parts of the world. It comes in sacks and bags like chips and blocks of wood, but of a beautiful white colour. Experiments and study have demonstrated to the proprietors the best method of disintegrating and picking apart these chips and blocks, and reducing them to a fibrous condition like jute, flax, or cotton. The material, once properly opened up, it is, by means of machinery, which is both simple and ingenious, formed into packing of the usual market sizes. These machines are as easily attended as the weaving looms, and each is under the care of a young woman who, after a short time, becomes expert in the business, and is capable of turning out a first-class article. It is completely reeled up in coils as made, and, when of proper size, is securely tied, covered with bagging, and sent to all parts of the world.

Although the business has been in operation little more than a year, it appears that the consumers of Asbestos Packing express themselves in the warmest manner as to its desirable properties and durability. In fact, the first packing in an ocean-going steamer was put in more than sixteen months since, and is still apparently as perfect as ever. The vessel alluded to is the *Anglia*, one of the Anchor Line Transatlantic Passenger Steamers. She has made 14 round trips to America and back, having steamed, on the same packing, over 98,000 miles. This, also, is the case with the first locomotive engine in Great Britain. The original packing, put in on 28th July of last year, remained in 11 months and 12 days, when the engine went into the repair shop for overhauling, and the packing was taken out. After that test it was apparently as fresh and useful as when first put in. The engine was an express passenger locomotive on the Caledonian Railway, and ran over 50,000 miles on the same packing. The practical uses to which it is not only possible, but probable, that Asbestos will be put, are almost numberless. Occupying, as it does, the position of a connecting link between the animal, vegetable, and mineral kingdoms, and possessing the properties of all, scarcely too much can be claimed for it in regard to its adaptation to appliances. Asbestos boats, tubs, boxes, wagon bodies, and even railway carriages, which will neither rot, burn, nor splinter, are said to be practicable and possible. In fact, so varied and peculiar are the qualities of Asbestos, and so adaptable is it to the wants of mankind, that it is looked upon by some as the "coming material." Gentlemen connected with the works have, during the last five years, made many curious and interesting experiments with it, and from the experience thus derived, have covered many uses of the materials with patents in Great Britain and other countries. The office of the Patent Asbestos Company, we may add, is at 154, St. Vincent Street, Glasgow.

BEDWELL'S LIFE-SAVING BOAT FITTINGS.

The object of this invention is to provide boats with seats, fittings, or appliances, so fitted or secured thereto that it shall be requisite that they should accompany such boats when putting to sea or taking the water. These seats, fittings, or appliances, consist of loose or detachable thwarts or other seats, which, from their construction, will serve as life-buoys when detached from the boat, as, for instance, when the boat is capsized or swamped. These seats are fitted at their under side with cork, or with air-tight metal, or other cases to give them increased buoyancy; and they are further provided with life-lines, or loops of small rope at their edges. When, therefore, the boat is immersed, the seats will be disengaged from the boat, and will float upon the water, and the lines which they carry will permit of their being secured and used as life buoys by the immersed crew. The gratings, foot boards, back boards, hatchway covers, and all other loose fittings of boats may also be fitted similarly to the seats and for the like purpose. Additional floating fittings may also be fitted in any boat, between the thwarts, along the side of the boat, or elsewhere, in cases when it would weaken the boat by having loose thwarts or otherwise. If thought desirable, one end of the life-saving fittings may be attached to the boat by a lanyard fitted with a loop and toggle (or button), so that a person when immersed may either remain near the boat or may detach the life-buoy seat therefrom. This invention also provides that all or any of these moveable fittings may be, if so desired, fixed temporarily in the boat in such a manner as may be most suitable, in order to give additional buoyancy to the boat instead of floating away independently.

DOCK FOR CIRCULAR IRON-CLADS.

Mr. Clark has recently designed an Hydraulic Lift-Dock, capable of raising circular iron-clads, of about 150 ft. in diameter, larger though similar to those which the Russian Government are now building for coast defence. This description of dock probably furnishes the most economical and expeditious means of docking such vessels, their great breadth rendering the construction of an ordinary Graving Dock very undesirable, as, in addition to all the usual difficulties to be overcome, lock gates or caissons of most unwieldly size would have to be provided. The dock is intended for a vessel drawing about 15 ft. of water, and weighing about 8,500 tons; the total weight to be lifted, including vessel, pontoon, girders, rams, &c., would, in this case, be about 14,000 tons. The presses—of which there are three in each column—are arranged in three groups, the pipes in connection with each group being shown by the boundary lines in the figure. It is estimated that this dock can be completed, ready for use, within eighteen months, at a cost of £214,000, including all its machinery and one pontoon, but not including any masonry.—*Naval Science* for January.

THE SCIENTIFIC EXPEDITION IN H.M.S. *CHALLENGER*.

Prof. Wyville Thomson, in accordance with the suggestions of the Royal Society, intends during his voyage round the globe, which is expected to last four years, to carry out an extended system of ocean soundings and deep dredgings, so as to obtain a more perfect knowledge of the physical and biological conditions of our great oceans. A chemical examination of the oceanic waters is to be continuously made, the specific gravities, and temperatures at varying depths, to be systematically ascertained; the velocity and drifts of the Gulf and other great currents, at different depths, are to be measured; a series of magnetic observations carried out with the most approved instruments. In addition to these matters, the zoology and botany of those countries least known to us are to be carefully studied. The ship is fitted up with an analyzing-room, a photographic-room, and every appliance necessary for the complete investigation of all the great physical phenomena of the Earth's surface. Dredging operations will be commenced in the Bay of Biscay, and continued through the whole length of the Atlantic Ocean; they will then be extended over the wide space of the Pacific Ocean, from Kamtschatka to the Antarctic Cirle.

THE BESSEMER CHANNEL STEAMER.

The following may be taken as the views of Mr. Bessemer and his friends, with regard to the anti-sea sickness vessel he is now building, as it appears in the last number of *Naval Science*, of which Mr. E. J. Reed (under whose superintendence the vessel is being built) is the able Editor.

"In ocean steamers great lateral movements (and also vertical ones) are produced in a ship when she is among large waves, except when she is cutting square across them, on account of her partaking of some of the motion of the wave particles, and being moved to and fro, and up and down, upon the slopes of the waves; but this cause will never operate upon this ship, because she will never, between Dover and Calais, fall in with a regular series of waves sufficiently large to produce it. She may be rolled a little from side to side by some Channel waves, but her size is too great as compared with them to make it possible for her to be swayed laterally from side to side as though she formed part of single waves, especially considering the great speed at which she will travel. The only appreciable cause of this lateral motion will, therefore, be that due to the movement of the axis of the saloon when the ship is rolling; and as we have already stated, this is placed at such a height in the ship as will reduce lateral movement to the least possible amount. We now come to the vertical motion. Objectors say that this is the most fatal of all causes of sea-sickness: and Admiral Elliot gives a very graphic description of his experience, when lying in a cot, of the effects of the lateral and vertical motions. There is no analogy, however, between the two cases. He deals with the case of a cot slung in an ordinary manner, at a usual place, in a ship at sea, where she meets with waves that are very large in proportion to such ships as he has served in. Therefore his ship was liable to great bodily rising and falling, and this was aggravated by the vertical components of the rolling and pitching movements. In the case of the Bessemer vessel, on her intended service, we have a large vessel floating in comparatively small waves, with all the motions, thus already small, made still smaller by special features in the designs, and (so far as the saloon is concerned) with the remaining portion of the rolling and pitching motions practically annihilated, or very nearly so. What resemblance is there between the two cases? Some bodily rising and falling there will no doubt be, but it will be comparatively small, especially when the ship is at full speed. But even if there were grounds for expecting very much larger vertical motion, that would in our judgment, enhance rather than diminish the desirability of abolishing as far as possible the remaining motions, and furnish no reason whatever for retaining much avoidable misery because some unavoidable discomfort may still remain. The substitution of steamers of this type for the present ones will be a great boon to numerous travellers, even according to the worst estimate that has been put upon their merits. If the saloon could not be kept level, and if lateral and vertical motions could not be prevented from being felt, or if there should be a slight falling off in speed—none of which events are likely to happen—still the greatly increased accommodation provided, the diminished effect the waves will have upon these ships to produce the motions complained of, and the superior speed they will possess to the present ones, upon the worst supposition that can be made, constitute claims that will ensure them the approbation of all who have ever suffered the misery and degradation of rough passages across the Channel in the existing steamers."

HORTICULTURE OF THE PAST YEAR.

The year 1872 was not particularly distinguished in the annals of horticulture, though it must be owned in its behalf that its memorials present few subjects for regret, if we set aside the one subject, over which man has no control, the weather. On that doleful subject enough has been said, and we would gladly forget all about it, but cannot, because it exercised a most potent influence on the horticulture of the year, and marred not a few well-planned enterprises. However, to show the weather that we are not vindictive, we will bear in mind that every one of the more important exhibitions was well sustained, and, as for the rest, let bygones be bygones. A healthier year has not been known in modern times, a few out of many of the products of the garden have been better than the average, and in districts were wells and springs had been shrinking for several years past there is now plenty of water, and the subterranean stores will last a long time. The activity of trade, the abundance of money, and the large and regular supplies from abroad of staple articles of food and materials of manufacture, have tended in a remarkable degree to mitigate the effects of rising prices, the disturbances in the labour market, and various deficiencies in the harvest of the year. We have turned the new leaf, the holidays are over, and the prospect is in no way clouded by portents; it is, in fact, at the present moment brighter than the retrospect, and we seem to be reaching out our hands to better things than those the past year made us familiar with.—*The Gardener's Magazine.*

THE FALLING STARS OF NOVEMBER, 1872.

I was so fortunate as to witness, at Boston, this marvellous display of meteors, now proved beyond all doubt, both by previous calculation and subsequent observation of astronomers, to have been due to Biela's comet passing very near the earth's orbit, and almost her place in the orbit at the above date; the comet's substance being, as Professor Herschel said, "distributed into the form of a meteoric stream." (*Times*, November 29.) Within a few minutes I counted hundreds of "falling stars," and they appeared to "fall" from, and to, every point of the compass. They were seen all over Europe at the same time, and their distance from the earth, according to the best observers, not being very great at the moment of their visibility, suggests the question whether the opinion once most prevalent as to their nature, cause of luminosity, *or* the extent of the earth's atmosphere be not erroneous. Are these cometary fragments in any sense solid bodies, which, although they have their origin far beyond the earth's atmosphere, are only visible through incandescence by friction with it? And if so, may not aerolites, or falling stones—of which the ancients have recorded examples—and fireballs also have a cometary origin? The periodicity of all has been found remarkably identical. May not some of the shooting stars of November 27 have mingled with our atmosphere, and had something to do with the abnormal atmospheric phenomena of the last three months? The astronomers who recorded the appearances of the meteoric shower also noted variations of the barometer before, during, and after that event; and during the recent gale. bright meteors were observed at Dover. May not comets, in fact, have some influence on our atmospheric changes?

HAWKE'S AND FREEMAN'S IMPROVED BILLIARD TABLES.

The object of these improvements is to construct tables so that they may be rendered more convenient than heretofore for the purposes of billiards, for dining, or for other purposes, and consists in the construction and use of a rising and falling horizontally telescopic and expanding or moveable frame, in addition to a fixed frame, together with moveable and adjustable covers or flaps, so that when it is necessary to convert the billiard table to a dining table, the top or bed thereof can, together with its rising and falling frame, be lowered, and the top or bed covered with suitable lids or covering pieces the size of the billiard table, and when desired, suitable flaps, trays, or additional length of covering pieces or lid, can be pushed out or drawn in by means of the horizontal, telescopic, or expanding part of the frame, or when required to be converted from a dining table to a billiard table, the top or bed can be elevated, the lid pieces removed, and the projecting lid drawn in or shortened if desired. These improvements may be carried out in practice by forming the legs of the table so as to receive and allow of the working of a rising and falling spring attached to the rising and falling framing supporting the top or bed of the billiard table, such legs to be connected or kept firmly in place and together by suitable ties or under-framing which is not moveable, and on which the rising and falling frame rests when at its lowest position. The billiard table with its cushions is furnished with a suitable lid or cover which may be in one or more pieces, and is put on when it is desired to use the table for other purposes. Attached to the frame are sliding shelves, trays, or flaps, which by means of a screw can be pushed out or drawn back, and so lengthen and shorten the table, lid, or cover, when desired. When the table is elevated, and used as a billiard table, suitable moveable wedges or other convenient means can be used to steady the table.

The Gardener's Magazine.—On the last Saturday evening in December a dinner was given at the Albion, Aldersgate, to celebrate the 1,000th Number of the "Gardener's Magazine," which, it appears, is the oldest of existing horticultural papers. Mr. W. H. Collingridge, of the *City Press*, presided, supported by Mr. Shirley Hibberd, the editor of the magazine, and a number of eminent landscape gardeners, botanists, land stewards, artists and others, who, by pen and pencil, have contributed to the publication.

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THE INVENTORS' INSTITUTE,

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Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868.

LORD RICHARD GROSVENOR, M.P.

Chairman of the Council:

SIR ANTONIO BRADY.

NOTICES.

THURSDAY, FEBRUARY 13TH, at Eight o'clock, p.m., a Paper will be read on "Tribunals of Commerce as Available for Patent Adjudications." By J. R. TAYLOR, Esq.

THURSDAY, FEBRUARY 27TH, at Eight o'clock p.m., General Meeting to receive the Report of the Sub-Committee on the Patent Laws.

Monthly Notices.

Tribunals of Commerce, the Lord Mayor and Mr. J. R. Taylor—A Fame-seeking Inventor—The "Antiquary" and "Naval Science" Reviews Postponed—Blake's Catechism of Zoology—Dr. Yeats' Books on Commerce—Hughes' Physical Geography—"Cosmos"—"Revue de Chimie"—School Board Tyranny.

LAST month we alluded to the fact that the Common Council of the City of London, which professes to represent all the members of that Corporation, without any reference to a large and influential portion of them—the liverymen of the guilds—has thought fit to enter in pigmy giant fashion on the great work of establishing the first Tribunal of Commerce in this country, and we appealed to the present Lord Mayor (Sir S. Waterlow) to use his influence for preventing the progress of the objectionable measure proposed by that body. We also questioned our old friend Mr. J. R. Taylor, who has been very active in promoting the establishment of such tribunals, as to what he was doing. His lordship has vouchsafed no sign, but Mr. J. R. Taylor gives us his answer in a pamphlet, dedicated to one of the guilds, which shows that he is still working with the view to obtain the adoption of a satisfactory plan for the establishment of such tribunals.

In a recent number of the *Athenæum* a person signing himself "Inventor," in a lengthy advertisement, proposes to submit to the British Association for the Advancement of Science "certain suggestions calculated [so he says], if properly carried into effect, to prevent effectually explosions from fire-damp in coal mines." Upon the conditions that within a reasonable time his communications shall be published at the expense of the Association, and "that in case any of the processes suggested and so published shall be developed and brought into general use within the period of ten years from the date of their publication, or shall form the basis, or a component part, of any developed process which shall be brought into general use during that time, Her Majesty's Government shall, upon his application at any time within that period, undertake to recommend Parliament to grant him such payment from the public purre as the Association shall declare him entitled to; and that the members of the Association shall pledge themselves in good faith in their individual, as well as their collective capacity, to use their influence to see him equitably and adequately remunerated." He promises to disclose his name and address. We prophecy that the Association will not (as far as pledging its members individually is concerned, we do not see how it can) accept "Inventor's" offer. We recommend him to adopt the usual course—take out his patent and push his invention into public notice, like every other ingenious man. However, this advertisement of "Inventor" shows the bad character of our unreformed Patent Laws, for if they were what they should be, such a public announcement would surely never have appeared.

We are glad to find that the *Antiquary*, a journal designed as a medium of intercommunication for men of letters, the archæologist, and the reading public, so well sustains its reputation. In another column we give an interesting quotation from its columns on the Falling Stars of November, 1872.

The last number of *Naval Science* fully sustains the high character it was expected to possess. It contains able articles on Naval Autumn Manœuvres, Strains of Ships at Sea, International Tonnage, Principal Armour Plate Experiments, 1872, The Bessemer Channel Steamer, from which we quote in another column, The Hydraulic-lift Dock at Bombay, Deep Sea Waves (by C. W. Merrifield, F.R.S.), and other important articles.

We have for the present to content ourselves with favourably commending to the notice of our readers "The Catechism of Zoology," by Rev. J. F. Blake, M.A., F.G.S. (Longmans), and two works by Dr. John Yeats (Virtue & Co.), one entitled "A Manual of Recent and Existing Commerce," the other "Growth and Vicissitudes of Commerce;" likewise a little volume of Gleig's School Series (Longmans) on "Physical Geography," by William Hughes.

The French serials, "Cosmos," by the Abbe Mognio, and the "Revue Hebdomadaire de Chimie," by Mons. Ch. Mene, are this month well worthy of attention.

The London School Board, instead of directing all its attention to the case of our juvenile human waifs and strays, and promoting, if possible, advanced *practical* education (which means nothing more nor less than technical science instruction) as the ultimatum of popular education, are, it appears, about to ask for powers to interfere with private schools. A nice land of freedom this little isle will become when we must not only submit to the *sic volo sic jubeo* of chief justices, magistrates, including the great unpaid, and even of Policeman X, but must also be dictated to by School Boards with regard to the educational curriculum of our children.

The Inventors' Institute.

At the members' meeting held on Thursday, December 5th, 1872, the chair was taken by J. Faulding, Esq., Member of the Council of the Institute, who announced that the paper for consideration that evening was on Trade Guilds as promoters of Invention and Technical Education, by F. W. Campin, barrister-at-law, Member of the Council of the Inventors' Institute.

Mr. Campin then proceeded with the reading of his paper, the substance of which is embodied in our article on "Industrial Organizations."

After this paper had been read, Mr. Faulding said that as he considered they had met together more for the purpose of a friendly interchange of ideas on an important subject than to listen to a lecture, and enter upon a formal debate, he would make a few remarks which they might either treat as deserving of debate, or pass over as merely conversational utterances. Mr. Campin had said a great deal about the necessity of utilizing the action of these guilds for the promotion of Technical Education and the advancement of invention, but he had not given the meeting his views as to the system to be adopted in regard to carrying out the kind of education referred to. One very important matter, it appeared to him, was the teaching workmen their trade in a thorough-going way; making them begin at the very beginning, and ascending from the simple and elementary parts of his art to the more complex operations of it. At the present day in nearly all the important trades, machinery or tools, usually termed self-acting, were largely used, the use of which reduced the artizan from the position of a craftsman to that of a labourer, though perhaps an intelligent one, and left him in ignorance of the elementary points of construction applicable to his art. Therefore he considered that in the workshop of any technical college or academy no steam power should be used, so that all workmen students should learn to work without such power. Another evil system as tending to prevent a workman from becoming the master of his art was the practice of putting youths to learn only one part of their trade. Another point of the greatest importance was the necessity there was for teaching drawing and practical geometry to workmen; for want of a knowledge of these subjects working men were often rendered incapable of carrying out new designs or inventions. He was clearly of opinion that when our workmen became properly technically educated, they would be able to work with inventors so as to carry out their plans with success.

Mr. Carttar said that he thought they were much indebted to Mr. Campin for bringing this important subject before the Institute, and he hoped he would persevere in his efforts to make trade guilds useful for the present and for the future; and he was quite sure that every member of the Inventors' Institute would be ready to join with him in tendering to Mr. Campin a cordial vote of thanks; and he would like to couple with the vote of thanks to that gentleman a vote of thanks to the chairman of the evening (Mr. Faulding), whose observations were of great practical value. He therefore moved that the thanks of this meeting are hereby accorded to Mr. Campin for his paper, and to Mr. Faulding as chairman of the meeting. This having been duly seconded, was carried by acclamation.

Mr. Carttar reminded those present that the business for the next meeting was the Patent Laws, which were just now placed in a critical position, as the report of the House of Commons Committee had recommended various changes which if adopted might place inventors in a very false position. Mr. Faulding and Mr. Campin having briefly expressed the gratification they felt at receiving this vote of thanks, the meeting terminated.

At the meeting on December 19th, an announcement by the Secretary of the Institute (Mr. R. M. Latham) was made that her Majesty's Law Officers were understood to be considering the course to be taken with reference to the report of the House of Commons Committee on the Patent Laws, and that it was expected they would take some action in the matter in a short time. It was therefore decided to adjourn the consideration of the present position of the Patent Law question until after Christmas.

GENERAL MEETING ON THE PATENT LAWS.

A general meeting of the members was held at the Institute's Rooms, 4, St. Martin's Place, Trafalgar Square, on Thursday, January 23rd, 1873, to consider and determine what steps should be taken with reference to the report issued by the Select Committee appointed by the House of Commons to enquire into the laws relating to Patents for Inventions. In the unavoidable absence of Sir Antonio Brady, the chair was taken by Mr. Hume Williams, Barrister-at-Law, member of the Council.

The chairman, in opening the proceedings, referred to the past labours of the Institute on behalf of the inventor's cause, and pointed out that the report of the House of Commons Committee was of a very discursive character, containing only a few points worthy of commendation, and that these were evidently a mere *rechauffé* of the suggestions made by the Institute. (Cheers.) Many, however, of the recommendations of the Committee appeared to have originated with themselves, and were fraught with very serious danger to inventors. (Hear.) He called upon Mr. R. Marsden Latham to read the Report of the House of Commons Committee, which was as follows:—

Report of the Select Committee appointed by the House of Commons "to inquire into the Law and Practice and the effect of Grants of Letters Patent for inventions. The Select Committee have considered the matters to them referred, and have agreed to the following Report:—

Your Committee have continued the investigation commenced last Session into the law, practice, and effect of Grants of Letters Patent, and after a careful consideration of the evidence on the respective branches of the inquiry given by eminent lawyers, patent agents, inventors, and manufacturers of this and other countries, have arrived at the conclusions contained in the following Resolutions:—

1. That the privilege conferred by letters patent promotes the progress of manufactures, by causing many important inventions to be introduced and developed more rapidly than would otherwise be the case.

2. That the same privilege leads to the introduction and publication of numerous improvements, each of a minor character, but the sum of which contributes greatly to the progress of industry.

3. That in the absence of the protection of letters patent, the competition of manufacturers amongst themselves would doubtless lead to the introduction of improved processes and machinery, but that it would probably be less rapid than under the stimulus of a patent law.

4. That it does not appear that the granting of pecuniary rewards could be substituted, with advantage to the public interest, for the temporary privilege conferred by letters patent.

5. That the existing patent laws of this country and its administration are in many respects defective, and require considerable improvements in the interests of the public, of manufacturers, and of inventors.

6. That protection for a limited period, and dating back to the time at which it is applied for, should only be granted for an invention on its nature, and particular points of novelty, being clearly described in a provisional specification, and upon the report of a competent authority that such invention, so far as can be ascertained by such authority, is new, and is a manufacture within the meaning of the law.

7. That letters patent ought not to be granted for any invention so protected until the provisional specification has been open to inspection, nor until a complete specification has been deposited fully describing the means of carrying it into effect, and such complete specification has been found by the same authority to accord in all essential particulars with the description of the invention in the provisional specification.

8. That all letters patent should be subject to the condition that the manufacture shall be carried on within the United Kingdom, so as fully to supply the demand for the same on reasonable terms to the public, and with due regard to the existing interests.

9. That letters patent shall not be valid for an invention which has been in use in a foreign country, unless a patent for the same shall have been granted in such country, and unless such letters patent shall have been granted in this country to the original inventor, his assignee or authorised agent.

10. That the duties payable on patents should be so adjusted as to encourage inventors to the utmost to make known their inventions, and that their primary application should be to the purposes of a complete and well organized record of industrial progress, and to an improved establishment for the conduct of patent business.

11. That no person concerned in the administration of the patent law should have a pecuniary interest in the number of patents applied for, granted, or refused.

12. That, inasmuch as the property created by the patent law, and the questions arising under it, are peculiar, the tribunal for deciding contentious matters in reference thereto should, both as to its constitution and procedure, be adapted to those peculiarities.

13. That the present condition of the Patent Commission is open to serious complaints.

14. That the Patent Law Amendment Act of 1852 provided that the Commission should consist of certain *ex officio* Commissioners, viz., the Lord Chancellor, the Master of the Rolls, and the Law Officers of the Crown for England, Scotland, and Ireland, together with other persons to be appointed by the Crown, but no such other persons have ever been appointed.

15. That the Lord Chancellor, the Master of the Rolls, and the two English Law Officers are now the only Commissioners, and by reason of their other engagements it is very difficult to get a meeting of the Commissioners, and practically an officer in the Patent Office does the duty of the Commission.

16. That the law and its administration are defective:

   (*a*) They admit of protection, and, subsequently, of a patent being granted for an invention which is not properly the subject of letters patent, not being a manufacture, or, being a manufacture, is not new; and of patents being granted for the same invention to several contemporaneous applicants.

   (*b*) They offer no guarantee against patents being used solely or chiefly for the purpose of obstruction.

   (*c*) The facilities afforded to an intending patentee for ascertaining whether his invention is new are insufficient.

   (*d*) The time, trouble, and expense involved in proceedings affecting the rights of patentees and of the public are excessive.

17. That the following alterations of the law, and of its administration, are desirable.

   (*a*) That protection be not granted to any invention except on the report of a competent person or persons that the conditions of Resolutions 6, as to such protection, are fulfilled.

   (*b*) That no warrant for sealing letters patent be issued until the conditions of Resolution 7 are fulfilled.

   (*c*) That in the case of several concurrent applications for a patent for the same invention, the patent be granted to the first applicant, unless it be shown to the satisfaction of the proper authority that he is not the first inventor.

(*d*) That all trials of patent causes should be before a judge, with the assistance of skilled advisers (who may be Commissioners of Patents), and, as a rule, without a jury; but with power for the court to order a jury for the ascertainment of facts in exceptional cases requiring the same.

(*e*) That the Commissioners be reinforced by the appointment of competent persons of legal, scientific, and technical experience, whose time is not occupied with other engagements to such an extent as to prevent their giving full attention to such administration.

(*f*) That the Commissioners should make rules, relegating to some of their body, together with competent assistants, amongst other duties, that of ascertaining as to every invention for which a patent is sought to obtained, whether it is properly the subject-matter of a patent; whether its nature, and the particular points of novelty, have been clearly described in a provisional specification, and whether, so far as can be ascertained by them, it is a new invention; and, as to the complete specification, whether it fully describes the means of carrying the invention into effect, and accords in all essential particulars with the description thereof in the provisional specification.

(*g*) That all letters patent should contain the following conditions not hitherto usually inserted therein, viz.:—That the manufacture be carried into effective operation within a reasonable time, within the United Kingdom by the patentee or his licensees so as to supply the demand therefore on reasonable terms; and that licenses be granted by him to competent persons on fair conditions, such conditions, as well as the fact of competency, to be determined in the event of disagreement by the Commissioners, due regard being had in such determination to the exigencies of foreign competition.

(*h*) That besides the assistance afforded to intending patentees by the examination of their specifications, and by the Reference Library of the Patent Office, more satisfactory indices and abridgments of specifications be provided, and more particularly that the practice of accepting, without control or revision, the abridgments prepared by the patentees themselves be abandoned.

(*i*) That the court or judges having discretion in patent litigation should avail themselves of the assistance of the Commissioners for the better definition and limitation of the matters in dispute in respect of particulars of breaches and of objections respectively.

(*j*) That in all future appointments of officers concerned in the administration of the patent law, remuneration by fees should (as it has been in the recent appointment of Her Majesty's Solicitor General be discontinued.

18. That suitable provision should be made by Parliament for the remuneration of the Commissioners who do not act *ex officio*.

19. That this Committee are of opinion that there should be an assimilation in the law and practice in regard to inventions amongst the various civilised countries of the world, and that Her Majesty's Government be requested to inquire of Foreign and Colonial Governments how far they are ready to concour in international arrangements in relation thereto.

Mr. F. W. Campin, Barrister-at-Law, and member of the Council, observed that he entirely concurred with the remarks of the Chairman, and he thought he should have no difficulty in convincing the meeting that although the report just read did contain some valuable suggestions, such as that marked (*c*) in the report, which would prevent a *bona fide* applicant for a patent being defeated by a later applicant racing before him to the Great Seal, a trick which is now allowed by our Lord Chancellors as legal; and those marked *d*, *e*, *f*, *h*, *i*, *j*, would be found to contain some good points, though so warped and distorted that if adopted in the form proposed by the Committee, they would, he thought, only work evil. (Hear, hear.) But the main objection was as to that one marked (*g*), the effect of which would be to oblige Inventors to make only such charges for the use of their inventions as the Commissioners might think fit. This, he thought, would be destructive to the right of inventors as to the property in their own inventions. (Hear, hear.) And he hoped that the Institute would come forford as one man and give a most strenuous opposition to so iniquitous a proceeding.

Captain J. H. Selwyn, R.N., Vice-President of the Institute, criticised with great force and humour the several propositions of the report, and he concluded by remarking that if the amendments suggested by the House of Commons were all they were willing to accord to inventors, the best thing that could be done would be to ask to be let alone. (Loud cheers.)

After some pertinent observations, expressive of strong disapproval of the Committee's recommendation, by Mr. F. H. Varley, Mr. A. J. Murray, Mr. Atterbury, of West Bromwich, Mr. J. R. Cressey, Mr. Carttar and others,

Mr. Latham observed that what was chiefly needed by inventors, and insisted on by the Institute, were, first, a great reduction in the cost of obtaining patents—(hear, hear)—as it was neither just or expedient that inventors should have imposed upon them a heavy tax for giving new inventions and articles of manufacture to the world. (Applause.) Secondly. That there should be a greater simplification in the cumbrous and unsatisfactory procedure now adopted for the obtaining of patents. (Hear.) Thirdly. That the duration of patent rights should be extended, and that invention right should be, at least, of equal duration with copyright Fourthly. That the infamous procedure in our Law Courts with regard to the endless expense and worry entailed upon inventors in vindicating their patent rights, should be wholly abolished—(cheers)—and a rational, inexpensive procedure should be substituted in its stead. (Applause) He maintained that the report just read so far from according any of these desiderata would—(1) Involve inventors in largely increased expense in obtaining their patents; (2) would augment, to an intolerable degree, the circumlocution and red tapeism of the present procedure in obtaining patents; (3) It entirely ignored the right of the inventor to such an increased duration of invention right as would confer upon inventors reasonable prospects of remunerating themselves for their labour, expenditure, and skill in developing, and perfecting new articles of manufacture—(hear); (4) and that no relief whatever was conceded by it in regard to the shortcomings and delays now attending patent law suits. (Loud cheers.)

It was ultimately decided that a subcommittee, to consider and report *seriatim* to the council, be appointed, consisting of Messrs. Captain J. H. Selwyn, H. Williams, F. W. Campin, F. H. Varley, A. Murray, and the officers of the Institute, and that a general meeting of the whole body of the Institute be convened to consider such report, and determine the steps to be taken in vindication of the inventor's rights.

We understand that Miss Hill, a daughter of the late Sir George Hill, Bart., is about to issue, in a cheap form, some very clever and spirited sketches and verses entitled "Passages in the Life of Blue Beard," and that they will be published by Dean and Son, of Ludgate Hill.

Proceedings of Societies.

THE INSTITUTION OF CIVIL ENGINEERS.

THIS society has now been in existence fifty-five years, having been established on the 9th of January, 1818. It was incorporated by Royal Charter on the 3rd of June, 1828, and the numbers of the several classes constituting the corporation on the 1st inst., were 16 honorary members, 759 members, and 1,151 associates, with a class of students attached of 267, together 2,193. Ten years ago there were on the books 20 honorary members, 413 members, 574 associates, and 10 graduates, together 1,017 of all grades. The class of graduates was abolished in the year 1867, when the class of students was instituted.

At the meeting of this Society on Tuesday the 14th of January, Mr. Hawksley, President, in the chair. Twelve candidates were balloted for and declared to be duly elected, including two members, viz., Mr. Arrott Browning, of the Madras Irrigation and Canal Company, and Baron Max-Maria von Weber, Imperial Royal Councillor in the Austrian Board of Trade. Ten gentlemen were elected Associates, viz., Mr. William Frederick Alphonse Archibald, B.A., Stud. Inst. C.E., Surveyor, Metropolitan Board of Works; Mr. Nicholas Procter Burgh, Waterloo-bridge-road; Mr. Henry Carmichael Christopher, Surveying Officer, P.W.D., Ceylon; Mr. Edmund Henry Harris, Engineer and Manager of the Water and Gas Works of the Wallasey Local Board; Mr. Benjamin Kitt, Gas Examiner to the Corporation of Bristol; Mr. John Mackay, Shrewsbury; Mr. Joseph Prime Maxwell, Stud. Inst. C.E., Contractors' Staff, Devon and Cornwall Railway; Mr. William Henry Scott, Local Fund Engineer, Dharwar, Bombay; Mr. John Isaac Thornycroft, Chiswick; and Mr. Richard Tiplady, Principal Resident Engineer, Bahia Railway, Brazil.

The Paper read was on the "Practice and Results of Irrigation in Northern India," by Colonel W. H. Greathed, C.B., R.E., Chief Engineer of Irrigation to the Government of the North-Western Provinces. This Paper will be found in another column.

It was announced that the Council, acting under the provisions of the bye-laws, had recently admitted Messrs. James Samuel Brown, William Coulthurst Gibbons, Arthur Trethowen Goodfellow, Alfred Joyce, Horace Challoner Knox, Theophilus Michell, Alexander Miller, jun., George Moyle, George Augustus Grant Shawe, and Zacchæus Walker, Students of the Institution.

VICTORIA (PHILOSOPHICAL) INSTITUTE.

A VERY full meeting of the members of this Institute recently took place at its rooms, 8, Adelphi-terrace, Mr. C. Brooke, F.R.S., in the chair. The election of several new members having been announced, Dr. C. R. Bree read his paper on "Darwinism and its Effects upon Religious Thought." Having defined these, he proceeded to show that the theories held by Mr. Darwin and his school, if argued out to their logical conclusions, were actually subversive of belief in divine revelation. Many quotations from various authors were given. We quote three: one from Mr. Herbert Spencer:—

"Every kind of being is conceived as a product of modifications wrought by insensible gradations on a pre-existing kind of being; and this holds as fully of the supposed 'commencement of organic life' as of all subsequent developments of organic life. It is no more needful to suppose an 'absolute commencement of organic life,' or a 'first organism,' than it is needful to suppose an absolute commencement of social life and a first social organism."

And the other from Mr. Darwin in his "Descent of Man" (vol. i. pp. 66-7), about the probability of religion having its origin in dreams. "It is probable, as Mr. Tyler has clearly shown, that dreams may have first given rise to the notion of spirits," and "the belief in spiritual agencies would easily pass into the belief in the existence of one or more gods." And so, according to Mr. Darwin's views, was religion "evolved."

And a third from *Nature*, July 11, 1872. In a recent review of a work called the "Martyrdom of Man," we are told that the author, after working out the evolution of animal and human faculties, goes on to "urge all enlightened men to take part in the great work of demolishing one of those institutions which, once the highest attainable, has now become injurious. Christianity must be destroyed." And he concludes his work in these words: But a season of mental anguish is at hand, and through this we must pass in order that our prosperity may rise. The soul must be sacrificed, the hope in immortality must die. A sweet and charming illusion must be taken from the human race, as youth and beauty vanish never to return."

Dr. Bree then called attention to the fact that according to the theory of evolution, "a primitive speck of matter came into being, evolved from non-living matter by the agency of physical forces." Professor Huxley had called this the basis of life, that such specks of living matter have given origin to all plants or animals, but Dr. Bree held that such a theory, even if true, did not go back far enough to explain the theory of all creation. After referring to the inconclusiveness of some, and the want of evidence for many other theories advanced by the Darwinian school, he urged that it was not the part of true science to attack religion, as was so often done, but rather patiently to practically pursue its course.

The discussion was taken part in by Dr. Irons (who held that truth could never contradict itself, and hence there could never be any real antagonism between science and revelation; Admiral Halsted (who urged the importance of thorough inquiry); Dr. Frazer; Mr. I. T. Pritchard; Captain F. Petrie (who, referring to a remark made by a previous speaker, stated that the results of the experiments and researches of Professor Huxley and other leading scientific men, had as yet proved that though it was comparatively easy to classify and arrange the addition of every animal, yet man held his place superior to all, and refused to "fit in" anywhere, and it was acknowledged that there was an immeasurable gulf between him, with all his attributes, and the rest of animal creation).

Dr. Bree having replied, the meeting was adjourned.

We may add that a letter was read from the Right Hon. W. E. Gladstone, stating that he had read the proof-copy of Dr. Bree's paper, and expressing the interest with which he had done so. From a printed report it appears that one hundred and fifteen additional members joined the Institute last year.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

A MEETING was held on Tuesday, January 7, at 9, Conduit-street, W., Dr. Birch, F.R.S., president, in the chair. The following gentlemen were duly elected members of the society:—Rev. John Finlayson, M.A.; Right Hon. William Ewart Gladstone, M.P., D.C.L., F.S.S.; D. Clewin Griffith, Esq., F.R.G.S.; John Henry Gurney, Esq.; Rev. W. Houghton; B. G. Jenkins, Esq.; Charles T. Newton, Esq., M.A., F.R.S.L.; George Warington, Esq., B.A., F.C.S.; Rev. John Wells, M.A.

Two papers were then read:—

1. On some recent Discoveries in South-Western Arabia. By Captain W. F. Prideaux, F.R.G.S.—This paper consisted of a carefully digested summary of the history and geography of the country of the Himyarites, from traditional Arabic literature, and the safer testimony of the coins and bronze inscriptions collected and translated by MM. De Longperier and Halevy.

The first portion of the paper was devoted to an examination of the capital and descent of the Shabean kings, whose seat of empire the learned writer maintained was not, as is generally supposed, at San'â, but at a place described by the Poet Algama Dhu Yazna as Dhu Raidan, the PAEIΔAN of Greek writers. Captain Prideaux also further endeavoured to identify some of the chief monarchs mentioned on the Himyaritic tablets with those referred to in Dean Vincent's "Periplus of the Erythræan Sea," by the help of the numismatic discoveries of the Duc de Luynes and the Compte de Vogüé.

In the second portion of the essay the numerical system of the Himyarites was examined, and several inscriptions translated, and the paper concluded by a reference to the cleverly forged bronze tablets, now in the British Museum, which have only recently been detected by philological criticism.

2. On the Tomb of Joseph at Shechem. By Professor Donaldson, Ph. D., K.L., F.R.S., B.A.—This was a description of the present state of that most interesting and well-authenticated antiquity, derived from a very recent visit to the Holy Land. The learned Professor believed that the actual sepulchre was in a vault under the present Moslem structure, which is considerably out of repair, and is in no small degree injured by the subsequent erection of two Mahommetan tombs, which are also falling into decay. In the further side of the building are two memorial tablets, and a third in English, recording the burial of Joseph, is about to be affixed by the order of the late British Consul at Damasusc.

ZOOLOGICAL SOCIETY OF LONDON.

JANUARY 7TH, 1873, Robert Hudson, Esq., F.R.S., V.P., in the chair. The secretary read a report on the additions that had been made to the society's menagerie during the month of December, 1872, amongst which were particularly noticed specimens of the American darter (*Plotus anhinga*), and a black-necked stilt (*Himantopus nigricollis*)—both new to the collection. Mr. P. L. Sclater exhibited some skins of birds, sent to him by Dr. George Bennett, F.Z.S., of Sydney, N. S. W., which had been collected by Capt. Fergusson, of the steamer *Captain Cook*, during a trading voyage to New Britain, New Ireland, and the neighbouring islands. A communication was read from Dr. J. S. Bowerbank, F.R.S., containing the fourth part of his contributions to a General History of the Spongiadæ. A second communication from Dr. Bowerbank contained a report on a collection of sponges formed in Ceylon by Mr. E. W. H. Holdsworth, F.Z.S. Mr. E. W. H. Holdsworth read a note on a rare sponge (*Xenospongia patelliformis*) found on the coast of Ceylon. Mr. A. H. Garrod read a paper on a peculiarity in the termination of the anterior margin of the nasal bones of certain birds, according to which the schizognathæ of Prof. Huxley might be divided into two groups, to be called schizorhinæ and holorhinæ. A communication was read from Dr. J. E. Gray, F.R.S., on the species of mud tortoises (*Trionyx*), and on the skulls of the different kinds. A second communication from Dr. Gray contained notes on the Guemul of Patagonia (*Huemula leucotis*), founded on the skins of a male and female guemul obtained in a valley of the Cordilleras, in lat 46 deg. S. L. by Don Henrique M. Simpson. A communication was read from the Rev. John T. Gulick and Mr. Edgar A. Smith containing descriptions of new species of *Achatinellinæ* from the Sandwich Islands.

The next meeting of the society for scientific business will be held at the society's house, in Hanover Square, on Tuesday, the 21st of January, 1873, at half-past eight o'clock, p.m., when the following communications will be made:—1.—The Rev. John T. Gulick.—On the classification of the *Achatinellinæ*. (Received 19th November, 1872.) 2.—Mr. Raphael Meldola.—On a certain class of cases of variable protective colouring in insects, &c. (Received 19th November, 1872.) Communicated by Mr. A. G. Butler, F.Z.S. 3.—Mr. A. H. Garrod.—On the visceral anatomy of the Sumatran rhinoceros (*Ceratorhinus sumatrensis*). Received 5th December, 1872.) 4.—Mr. A. D. Bartlett.—Notes on the birth of a Sumatran rhinoceros. (Received 7th January, 1873.)

VIENNA UNIVERSAL EXHIBITION, 1873.

NOTICE TO BRITISH EXHIBITORS.—CUSTOM HOUSE REGULATIONS.

THE following is an abstract of the rescript of the Imperial and Royal Austrian Ministry of Finance, with regard to the Custom House Regulations to be observed in respect of goods sent from foreign countries to the Vienna Universal Exhibition, 1873, dated August 9, 1872, and published in the *Austrian Imperial Law Gazette*, xlv., No. 127, which has been communicated by his Excellency Baron von Schwarz-Senborn. Her Majesty's Commissioners—(office, 41, Parliament-street), have caused a translation of the rescript to be prepared for the information of exhibitors in the British section.

1. The frontier custom houses to direct goods to chief custom house in the Exhibition. Detailed list of contents of packing cases to accompany each consignment. 2. Chief Exhibition custom house office examines goods, and books the detailed lists. Foreign commissions must keep an account of the goods received. 3. Detailed list of contents to specify only goods according to commercial denomination as to kind and quantity. 4. No goods to be allowed to be taken away without permit. 5. Goods going back will be directed by chief custom house to the respective frontier custom houses. 6. Goods remaining in Austria or Hungary are liable to import duty. 7. Goods, owners, and commissions are responsible for the amount. Agents taking charge of goods incur the same responsibility. 8. Discrepancies between contents of packages and the detailed list, and unauthorized removal and sale of goods will be dealt with according to law. 8. Tobacco and goods manufactured thereof are not permitted to be sold in the Exhibition, nor to be brought away for such purpose. 10. Goods not entered for exportation three months after the close of the Exhibition are liable to import duty.

NOTICE TO BRITISH EXHIBITORS.—PROTECTION OF INDUSTRIAL DESIGNS AND INVENTIONS.

1. Exhibitors can obtain a "Certificate of Protection" by applying to the Director General. Application must be made previous to the opening of the Exhibition, or, if later, before the installation of the objects in the Exhibition. It must be accompanied by an exact description of the exhibits, and double copies of plans or drawings, or two specimens of the trade mark, design or model in separate cases. If application be made through an agent, letter or authorization must be added likewise. 2. "Certificate of Protection" is granted gratis, and is valid till 31st December, 1873. Exhibitors can apply for a regular patent, or protection of trade mark or design, before the 31st December, 1873. 3. No appeal against the Director General's decision against the granting or refusal of Certificate of Protection allowed. 4. Double registers of applications and certificates issued will be kept. 5. Certificates of protection will be published in Austrian and Hungarian Official Gazettes. Registers open for inspection to every one' Secrecy observed, if desired.

IRRIGATION IN INDIA.

By Col. W. H. Greathed, C.B., R.E., &c.

The object of this paper, read at the Institution of Civil Engineers, is to describe what has been done, and what is now doing, in that portion of Upper India where irrigation had been longest practised, and on the largest scale. The conditions which created a demand for artificial irrigation were exhibited by a map showing the average rainfall over the surface of British India, distinguishing the rainfall of the North-East Monsoon and of the South-West Monsoon. The tract of country under consideration was included between the Himalaya range on the north, the River Brahmaputra on the east, and the rivers which merged into the Indus on the west. The principal geographical features of the region were the plains drained by the Ganges and the Indus and the intervening table-land of Central India, comprising a country four times as large as France in area as well as in population. The Plains of the Ganges and of the Indus rose gradually from the level of the sea to an elevation of 1,000 to 1,100 feet where those rivers debouched from the mountains, and the highest general level of the central table land was about 2,000 feet. The distribution of the rainfall in India was then noticed. It was very large during the South-West Moonson along the range of the western ghats, much less in the interior, and it rapidly decreased towards the mouth of the Indus; but it was again larger on the table lands, bordering the valleys of the Nebudda and the Taptee. At the southern point of India and in Ceylon, the South-West Moonson brought but little rain, which, however, increased up the eastern coast of the peninsula, and on the east of the Bay of Bengal there was an abundant fall, which extended over the country between the sea and the Himalaya; thence, in the plains of the Ganges, the rain constantly diminished as the distance from the sea and from the Himalaya increased. These varying conditions of moisture involved different agricultural conditions, which were influenced by diversities of soil and of temperature. The temperature ranged from tropical in the south, with an approximately uniform heat, to semi-temperate in the north, where the summer and winter were sharply defined.

The North-Western Provinces, exclusive of the Benares division, where there were no State works of irrigation, might be described as consisting of three zones:

1st. The sub-Himalayan tract, north of the River Ranegunga, which was copiously watered by the rainfall on the mountains and by numerous small rivers flowing out of them. Most of these rivers dried up after the termination of the rainy season; but on a great part of the length of this tract a deposit of sand and boulders, forming a continuous belt fifteen miles wide, created a vast filter-bed, which, being bordered on the down-hill side by a band of clay, became a covered reservoir. The natural pressure, augmented by the rapid slope, across which the filter-bed laid, forced water under the clay, and produced a line of springs, on the other side of the clay band, which fed numerous small streams and refreshed the country. The local name of the belt of boulder was "Bhabur," and of the tract which it watered by filtration "Terai."

2nd. The Plains, being the area included between the Ranegunga and the Jumna rivers, and including the Muttra and Agra districts, on the right of the Jumna. This tract had a loamy upper soil varying from sand in some parts to light clays in others. But fine sand was generally found at no great depth. In this tract the drainage ran from N.W. to S.E. parallel to the Ganges and the Jumna, which rivers embraced nearly the whole area.

3rd. The Province of Bundelcund, which sloped from the high table-lands of Central India northwards towards the Jumna. The lands bordering the rivers were dry and stony, and higher than the intervening basins, which consisted generally of rich black cotton soil. There had been a great upheaval of the region near the foot of the table-land; and trap and granite rocks cropped out freely, forming isolated hills of fantastic shapes.

The climate of the North-Western Provinces was exceedingly dry, and hot westerly winds prevailed in April, May and June, during which months vegetation of unwatered plants was apparently suspended except in the case of the melon tribe. The rain-clouds of the South-West Monsoon seemed to travel up the Ganges, and they reached the North-Western Provinces about a fortnight after rain had fallen at Calcutta, when the season of agriculture commenced. The agricultural operations, it was observed, were of the most primitive description, and the crops were liable to fail if the fall of rain was not distributed over a sufficient number of days, or was otherwise deficient. The uncertain crops of the rainy season were Indian corn, and millet of various kinds, which formed the staple food of the agricultural labouring classes.

The rainfall in Hindostan of the winter or N.E. Monsoon was everywhere less than in the summer. It was most felt on the eastern coast, from Madras downwards, and in Ceylon was very copious. On the western coast the only considerable winter rain was between Cannamore and Vingorla. As in the S.W. Monsoon, the rainfall of the N.E. Monsoon diminished in the valley of the Ganges as the distance increased from the sea, and became very light in the North-Western Provinces and the Punjab, where it was due at Christmas. If the winter rain was favourable, the barley and wheat had a fair chance; but on unirrigated lands the spring crops of cereals were always uncertain. In the Buldelcund zone, barley and wheat were scarcely ever sown, on account of the exceeding dryness.

The Plains had an average annual rainfall of 26·6 inches—enough for agricultural needs; but as the greater part fell, perhaps, in a fortnight, and there was no rain from September to July, except the Christmas showers, the ordinary crops of the country often failed, and the richer crops were entirely dependent on artificial irrigation. In the sub-Himalayan zone, which had a rainfall of 48·7 inches, rice was successfully produced, without artificial irrigation, in about two years out of three; sugar was less certain under the same condition. In Bundelcund the average rainfall, 33·7 inches, sufficed for the ordinary monsoon crops, but it was especially fickle, and scarcity was in consequence very common in that country.

The people of the North-Western Provinces had practised sinking wells for irrigation from the earliest periods. The depth at which water was found in the Plains varied from 10 to 50 feet below the surface. At the lesser depth a little pit supplied as much water as could be lifted in a day in a jar attached to a light balance-beam worked by men. Two men could keep a plot of an acre watered, but the demand on labour prevented its employment on a large scale. Pits of this description fell in during the rainy season, and had to be annually renewed at the cost of the tenant. Deeper wells, lined with brushwood cylinders, and worked by bullock power, cost from £5 to £18 a piece, and employed six men and three pair of bullocks every day to keep 5 acres watered. The duration of such wells varied, according to the soil, generally between two and ten years, and in some favoured tracts could be constructed without lining. A serious objection to the majority of wells was that they contained surface water only, and did not touch the springs, and if overdrawn they fell in. As a rule, the springs could only be reached by wells lined with brickwork, costing from £15 to £30 a-piece, which cost was almost prohibitory to their employment for irrigation. Where water was plentiful they paid best when made of sufficiently large diameter to allow three or four pairs of bullocks to work at once; in which case they commanded 20 acres of land, and cost up to £80 and £100 a-piece.

In the sub-Himalayan zone, wells had not been much used for irrigation—the people had, instead, dammed the rivers and led off from the dams irrigation channels to the fields; but the consequent stoppage of outfal had water-logged the country, and given rise to malaria. A Bill was now before the Legislative Council of India for the removal of the whole of these dams, on the Government making proper compensation either in water supply from other sources or in money. In the third, or Bundelcund zone, no wells could be sunk for purposes of irrigation, because of the depth of the water from the surface, the poverty of the community, and the scanty population. The amount of land irrigated from some lakes had not as yet exceeded 1,300 acres. Although individually diligent in their own concerns, the natives of Northern India were wanting both in the means and in the mutual confidence requisite for combinations in works of general advantage; and generally, improvements, unless proposed and carried out by the officers of the Government, were not done at all.

Extracts were then given from the official account of the famine of 1868-69, describing the desolation in districts unprovided with canals, and the security of those that were irrigated.

The scheme projected for turning all available waters to the greatest advantage was next detailed. The characteristics of the Rivers Ganges and Jumna, which included between them the larger part of the zone of "Plains," were identical. Both rose in eternal snows, and both received large affluents before leaving the mountains. The drainage area of the Ganges was 11,200 square miles, that of the Jumna 7,800 square miles. The flow of water in the greatest floods was respectively 230,000 and 160,000 cubic ft. per second, and when these rivers were at their lowest, from the middle of January to the end of March, the flow was reduced to 4,000 cubic ft. and 2,000 cubic ft. Unfortunately, the period of lowest supply was that of greatest demand. The rivers left the Himalaya on boulder beds, sloping 8 to 10 ft. in a mile, which, after a few miles, were replaced by fine sand, wherein the course of the rivers was constantly varying. Beyond the end of the boulder formation the surface of the rivers was generally about 40 ft. below the adjacent country.

The head works of the Ganges and the Jumna Canals had been fixed on the boulder portion of the river beds on account of its stability, and for facilities for leading and regulating the supply of water. All the water in the rivers in January was required, to obtain which dams were constructed across the perennial streams of the rivers, and at times the whole of the visible water was turned into the canals. Temporary dams of crib-work, boulders and shingle were found to be the most suitable for diverting the water; whilst masonry structures were preferred for the regulation of supply channels. The Ganges Canal was, perhaps, the largest work of the kind in the world. Its full capacity was 6,500 cubic ft. of water a second. The width of bed on the was Solani Aqueduct, 18 miles from the head, 164 ft., and the depth 10 feet. The main channel was 348 miles in length, and it was navigable throughout; the branches were 306 miles in aggregate length, and the distributaries 3,071 miles. A carriage road was kept up on all main and branch canals, and the banks were planted with timber trees. The flow of water per second in 1870-71 was 4,300 cubic ft., and 767,000 acres were watered in 5,061 villages. Irrigation commenced 22 miles below the head works, and was diffused over an area 320 miles long by about 50 wide. The sub-Himalayan drainage, which the canal crossed, was passed partly into, partly over, and partly under the canal. The works in the upper part were chiefly constructed on block foundations, perforated with wells, by means of which they were sunk in running sand to a hard stratum. The Solani Aqueduct spanned a valley 2½ miles in width; its foundations were supported by the pressure and friction of wet sand, and no subsidence had occurred. The slope of the country in the upper part of the canal was much more rapid than that given to the canal beds, a difficulty which had been overcome by masonry ogee falls; in place of these, vertical weirs, with long crests, were being built on new canals. The difficuly of the conditions under which the Ganges Canal works were commenced was detailed, and the functions of the canal officers. The earning of a cubic foot of water on the Ganges Canal, in 1870-71, was £44 per annum; on the Eastern Jumna, £59.

The net income of all the canals in the North-Western Provinces, in 1870-71, after the payment of working expenses, was £182,437, being 6·64 per cent. on the capital cost of £2,714,631. Measures were now in progress for reducing the rapidity of the current of the Ganges Canal for navigation purposes; and a commencement had been made in leasing the water-power to persons competent to utilise it.

As there was no water in the Ganges Canal available for extensions, it had been determined to construct a weir across the Ganges at Rajghat, for a Lower Ganges Canal, with a capacity equal to that of the Upper Canal, on an estimate of £1,825,000. The combined system would probably be completed for £5,000,000, and return 13 per cent. The weir across the Ganges at Rajghat would be founded in running sand.

The Agra Canal had been projected for the irrigation of the Muttra and Agra districts, on the right bank of the Jumna, below Delhi. A weir 2,428 ft. long had been built across the Jumna, at a point where a spur of quartz from the Aravali range abutted upon the river. The work had no foundations. It consisted of two parallel masonry walls, 2,428 ft. long, running from end to end of the weir, of which the footings rested on the fine sand of the river bed at low-water surface level. Between these walls, which were 26 ft. apart, stone was packed, and a slope of stone was constructed, up stream with a base of 40 ft. and down stream with a base of 200 ft. Scouring sluices were constructed on one flank of the weir, to keep a clear channel in front of the canal head. This weir, when partially constructed, had satisfactorily withstood the greatest known flood on the Jumna. The Agra Canal had a maximum capacity of 2,000 cubic ft. of water per second, and was designed to irrigate 350,000 acres. For the benefit of the plains and zone east of the River Ganges, an Eastern Ganges Canal was about to be constructed, taken off at the bottom of the boulder formation. This would water 450,000 acres, equal to 35 per cent. of the area of the districts commanded.

In the Bundelcund zone, owing to the granite and trap formations, the rainfall was carried off by the rivers with great rapidity, leaving the river beds almost dry soon after the rain had ceased. The channel of the River Betwa was 1,450 ft. wide and 61 ft. deep near the town of Jhansi. This was often filled in July and August, the flow of water being 700,000 cubic ft. per second; yet, in January, the flow was reduced to 50 cubic ft., which passed through a notch 6 ft. wide. It was intended to build a weir across the River Betwa 26 ft. high. The Betwa Canal would then water 120,000 acres in the Jaloun and Humeerpore districts. The estimated cost was £170,000, and the anticipated return from water-rate 10 per cent. Other weirs were projected across the Rivers Dussan and Keyn, estimated to cost £124,000 and £130,000 respectively, and to return 11 per cent. on the outlay; the weirs would stand on granite sites. Lastly, fifteen lakes in Bundelcund would be made available to water 22,000 acres and to return £2,500 a-year on a capital outlay of £8,200. By these means 700,000 acres would be annually watered in Bundelcund and Jhansi, an area sufficient to ensure the province against famine, and, it was hoped, to restore it to its pristine fertility.

The financial results were then explained. At the end of the year 1871 upwards of a million acres were irrigated from existing works, which afforded a net return of £182,500. The capital expended had been £2,747,000, and the net profit on the whole was 6·64 per cent. When fully completed the cost of the undertakings would amount to about £7,500,000, with a return of 12 per cent. on the capital when the canals were fully developed.

A large system of canals had been projected for the irrigation of the province of Oude, from the River Sardah, and would extend to some part of the Benares division.

In the Punjab, at the foot of the Himalaya, there was a zone of rainfall of 40 in. a year, bounded on the south by a belt where the rainfall was 16 in.; the remaining country to the south was almost rainless. The principal canal in operation was the Western Jumna, an old Mahomedan work. It had paid nearly £2,000,000 clear profit, after repaying capital. The Baree Doab Canal, taken from the River Ravee, was constructed on the model of the Ganges Canal, and was gradually making way.

There were profitable inundation canals on the Indus, the Chenab, and the Sutlej. The Sirhind Canal, now under construction, would cost about £2,000,000, and irrigate a country where rain was very scarce. It was calculated to pay about 9 per cent.

It was observed that whilst the characteristics of irrigation in the North-Western Provinces, Oude, and the Punjab, were much alike, they differed largely from the conditions current in Madras. In Northern India irrigation was carried over the whole country; crops were watered both in winter and in summer, and irrigation afforded the greatest benefit in the winter, when there was little or no rain; but in Madras, canal-irrigation was only effected during the rainy season when rivers were full, and was confined to the deltas at the mouths of the great rivers.

In conclusion, it was stated that about two hundred and fifty engineers, of and above the rank of assistant-engineers, were employed under the Indian Department of Irrigation, in developing the advancement and prosperity of the country.

TELEGRAPH AMALGAMATION.

THE preliminary arrangements for the amalgamation of the telegraph lines east of Bombay are now under consideration, and it is gratifying to learn that the representatives from the various colonies in Australia are about to meet in Sydney to fix upon the amount of subsidy to be paid in exchange for a reduction of tariff, thus showing that the colonies are quite alive to the importance of cheap telegraphy, and are prepared to make large sacrifices to obtain it. At the present time the impression, to some extent, prevails, and the question is being actively ventilated, that cheap telegraphy can be brought about by competing lines; never was there a greater fallacy, and I take this opportunity of warning those who have hitherto done well in their investments to shun proposals having no other justification than mere competition. Already a sixth Atlantic cable is being assiduously canvassed, the idea of its utility is, that it should be laid from Liverpool to New York direct, a distance of 3,200 miles, at a cost of £1,000,000. Now, the new French Cable, for which the money has been subscribed, will be shorter in length by 800 miles, and will possess a carrying capacity of 27 words per minute, or double that which can possibly be attained by a single direct line, as proposed, of 3,200 miles; the actual fact—well-known to electricians—being that after the first 1,000 miles the resistance of the cable is enormously increased. Such technical details as these, though of vital consequence to subscribers, will of course be withheld from any prospectus which may be issued. Investors may also be reminded that the shares of the Great Western Telegraph Company (which undertaking was incubated under the most powerful auspices in Liverpool and Manchester with almost the identical object of this proposed venture) and upon which £8 out of the £20 per share have been paid, are now quoted at 6 to 5 discount. These remarks apply also to another scheme to tap the traffic between Trieste and Egypt. Upon this competitor, for which it is sought to raise as much as £400,000, Sir James Anderson has issued an important letter, which is well worthy the attention of shareholders whose support is counted upon. All these attempts at competition, however absurd they be, draw prominent attention to the great fact that the directors of existing lines must not delay their arrangements for an amalgamation of all Submarine Cable Companies under one great organization. By this means expenses can be reduced to a minimum, and innumerable other advantages would be attained. At present, without the boards of any new scheme, there are no less than thirty-four directors on the lines now working, which practically form but one system of communication between East and West—or, in other words, there is one director for every £298,900 of capital, and no less than 11 of the directors are receiving either double, triple, or quadruple fees by being on separate boards. Such a condition as this cannot continue; it is as unnecessary as it is contrary to the interests of the shareholders, and the latter will, no doubt, at the forthcoming meetings insist upon the question being thoroughly ventilated, and the remedy of amalgamation more extensively adopted. The Board of the London and North Western Railway Company, with a capital of over £60,000,000, does not exceed thirty members, or equal to one director for every £2,000,000 of capital.—From the *Monthly Circular* of Mr. William Abbott, 10, Tokenhouse-yard, London.

THE *Revue de Chimie* states that a M. Petit has invented a cheap substitute for linseed oil for use in painting, which has, it appears, been tried with considerable success by persons who testify to its value. It is said to resist rain, is not cracked by heat, does not peel off from dryness nor with extreme cold, and paintings done with this oil present the same appearance as those done with the natural linseed oil; further, it is said, that it does not give off any appreciable odour.

Those old and popular volumes "Debrett's Peerage, Baronetage, and Knightage" will shortly be issued for the 159th time. The present publishers (Dean and Son) will, we understand, continue them in the form they have appeared in for the last ten years.

APPLICATIONS FOR LETTERS PATENT.

CONTINUED FROM PAGE 2.

On December 20th—3861 to 3873.—C. H. Sidebotham. Arrangements and constructions of school desks and seats, and also of the standards for supporting them.—S. Neville. Ornamenting pressed and blown glass, and apparatus therefor.—L. Simeon and R. Simeon. New or improved method of applying petroleum products to illuminating purposes and apparatus belonging thereto. (com.)—J. Borthwick. Form and method of constructions worms of employed in worm-gearing.—W. B. Williamson. Cases or holders for holding and facilitating the slicing or cutting of pressed or cooked meats, Stilton cheese, and other provisions.—T. Kennelly. Blow pipes used in soldering and brazing metals and for other purposes.—J. C. Kennedy. Rescue apparatus to be used in ice accidents.—R. D. C. Shaw. Machine or apparatus for loading or lifting, and in some cases for preparing to be loaded or lifted, yard or other manures and other materials into or on carts or other receptacles or places.—H. P. Holt. Locomotive engines to be used either on a permanent way or on common roads and adapted for use also in mines and other underground works.—H. Kesterton. Construction of steam boilers.—T. Penn. Apparatus to be applied to watercloset and other cocks, which apparatus is also applicable as a self-acting releaser for pile-driving machinery and other purposes.—J. Wade. Machines for printing. W. M. Brown. Railways (com).

On December 21st—3874 to 3887.—J. W. Thompson. Lining bands for hats and caps.—B. Coone. Machinery for filling moulds with moist and soft clay and other plastic materials (com.) (Complete specification).—L. Rozsavolgyi. A new system of joints for earring hooks, applicable also to other articles of jewellery (com.)—J. Dodd and W. Peel. Reaping and mowing machines (Complete specification).—F. W. Crossley and W. J. Crossley. Machinery for grinding cylindrical and conical surfaces.—G. A. Huddart. Railway brakes.—R. S. Symington. Applying gas for heating purposes, and in apparatus connected therewith.—D. Scottergood. Finishing hosiery and other goods.—W. W. Fereday. Treating human excreta, and in apparatus for working the excreta and converting the same into a dry and highly-concentrated manure.—W. J. Morris. Holster and pocket pistols.—J. C. Lones, and J. Lones, and C. Vernon, and E. Holden. Manufacture of axles for carriages, and in machinery to be employed for that purpose.—W. Hope. Application of steam power to the cultivation and movement of land.—A. Prince. Manufacture of asphalte for paving and covering roads and ways, and in the apparatus employed therein (com.)—A. Krieger and A. Cauderlier. Stopper for bottles.

On December 23rd—3888 to 3896.—J. C. Morrell. and J. Proctor, construction of privies and dry closets.—J. Senior. Improvement in the process of unhairing and preparing skins or hides to be employed for making or dressing into leather of any kind.—J. W. McCarter. Condensing steam.—W. H. Mitchell and R. Jordinson. Carding engines.—A. Samuelson. Laying asphalte, mastic, or other similar pavement.—N. J. Suckling. Steam generators.—W. Pidding. Manufacture of ignitible lights or matches, and in some of the materials of which they are composed, and in holders, receivers, or boxes for holding the same.—P. Conniff. Manufacture of fire-bricks.—J. Brown and B. Brown. Hand signal and other lamps.

On December 24th.—3897 to 3918.—W. Mann. Charging and discharging gas retorts.—T. S. Prideaux. Apparatus for regulating the supply of air to furnaces.—I. A. Vacherot. Propelling and steering ships and boats, and in apparatus or means employed therein.—A. C. Henderson. Match box or case for automatically lighting wood or wax matches (com.)—G. Rydill. Construction of apparatuses and in machinery for obtaining and applying heated air to furnaces for the consumption of smoke and the saving of fuel, improving ventilation in rooms, drying animal and vegetable substances, and in the construction of furnaces.—W. E. Gedge. Apparatus or drawing-board for obtaining angular or perspective drawings from right-lined drawings (com.)—F. Zysel. Obtaining and applying motive power.—W. R. Triscott. Construction of pipes for smoking tobacco (Complete specification).—J. Radford. Steam, gas, water, or fluid taps.—W. T. Garnett, John Wheather, and W. Waring. Machinery for combing wool, flax, silk, or other fibrous substances.—E. P. North. Combined tables and reading desks or easels.—F. T. T. Eiben, and G. A. Buckholz. Motive power.—S. Metcalf. Self acting mules for spinning and doubling. G. Haseltine. Trip hammers (com.) (Complete specification).—A. C. Kirk. Steering apparatus, and improved motive-power apparatus for working the same, the said improved motive-power apparatus being also applicable for working winding, hoisting, or other apparatus.—T. Williamson, and W. Walker. Construction of reciprocating steam engines.—L. A. Badin. Closets and apparatus for collecting and disinfecting fœcal matters and converting the same into manure or human guano.—F. J. Manceaux. Cartridges for breech-loading small arms.—G. H. Smith.—Method of carbonizing clay, plaster, chalk, porous stone, and other like porous materials.—J. Cowie. Writing desks known as secretaires.—A. M. Clark. Breech loading firearms (com.)—H. W. Whitehead. Machinery for combing wool, cotton, flax, silk, and other fibrous substances.

On December 26th—3919 to 3921.—T. Williams. Combinations of materials for the manufacture of fire-bricks, retorts, and crucibles, linings for furnaces, cupolas, and vessels in which great heat is employed.—E. T. Hughes. Machines for scouring and polishing needles (com.)—R. Brydon and J. S. Davidson, and T. A. Warrington. Machinery or apparatus for drilling, boring, or cutting rock and other hard substances.

On December 27.—3922 to 3937.—H. Taylor, H. Warburton, T. Taylor, and W. Wadsworth. Combing cotton and other fibrous materials.—C. D. Abel. Paper weights, boxes, and other articles, so as to imitate rouleaus of coin (com.)—W. McAdam. Utilising waste products of chemical works.—H. Copland. Formation of roads or ways with wood paving with or without rails, and in apparatus for the purpose.—D. C. Miller. Distilling, evaporating, or concentrating saccharine and other solutions or liquids.—W. Lattimer. Apparatus for extinguishing fire.—G. J. Cross. For tramways, railways, contractors', and other carriages, waggons, or other vehicles.—S. Osborn. Prickers to be used in blasting or mining.—B. White and P. T. Hendry. Treating liquids to be burned for illuminating purposes (com.)—W. Hutchinson. Construction of washing machines.—J. Quin. Manufacture of belting for driving machinery.—J. Quin. Manufacture of solid india-rubber tubing, and in machinery or apparatus employed in such manufacture.—J. M. James. Locks or fastenings for purses, bags, and other like articles.—A. M. Clark. Brick machines (com.)—G. M. Phelps. Printing telegraph.—H. M. Mellor. Hosiery goods, and in apparatus employed therein.

On December 28th.—3938 to 3946.—G. Rydill. Steam boilers, furnaces, and flues.—R. Williamson and J. Dale. Manufacture of salt, and in apparatus employed therein.—F. Garforth. Apparatus for spinning and doubling cotton and other fibrous substances.—G. Bedson. Rolling wire and other rods or bars of metal.—G. Gulliver. Spindles for locks, latches, and other fastenings.—T. Salmon. Apparatus for cutting shoe linings, also applicable to other fabrics.—H. Venman and C. J. Warne. Manufacture of flexible type, inking pads, and rollers used for stamping and printing letters and devices.—C. F. Wood. Machines used in the manufacture of cigars.—W. B. Patrick. Apparatus employed in the process of filtration in sugar refining.

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